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RECURRENCE AND EXTENT OF GREAT EARTHQUAKES IN SOUTHERN ALASKA DURING THE LATE HOLOCENE FROM AN ANALYSIS OF THE RADIOCARBON RECORD OF LAND-LEVEL CHANGE AND VILLAGE ABANDONMENT

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ABSTRACT. The incidence of plate-boundary earthquakes across 3 prospective tectonic segments at the Alaska subduction zone (ASZ) in the late Holocene is reconstructed from geological evidence of abrupt land-level change and archaeological evidence of discontinuities in occupation of native villages. Bracketing radiocarbon ages on uplifted and down-dropped coastal deposits indicate that great earthquakes likely ruptured the plate interface in the eastern segment (Prince William Sound [PWS]) about 800, 1400, 2200–2300, 2600–2700, 3100–3200, and 3600–3700 cal BP. Evidence for an event about 1900 yr ago, and the possibility that the 2600–2700 cal BP event was a closely spaced series of 3 earthquakes, is restricted to parts of Cook Inlet. Geological evidence from the central (Kenai [KEN]) segment is fragmentary, but indicates that this segment likely ruptured about 1400 yr ago and in the triple event about 2600–2700 yr ago. The geological record from the Kodiak-Katmai (KOKA) segment at the western end of the ASZ has limited time-depth, with localized evidence for ruptures about 500, 1000, and 1300 yr ago. ^{14}C ages and stratigraphic descriptions from 82 prehistoric villages and camps on the coast of the Gulf of Alaska reveal fluctuations in site activity that correlate with paleoseismic episodes. Hiatuses in site occupation occurred about 800, 1400, and 2200 yr ago in the PWS and KEN segments. The fragmentary older record from the KEN segment also reveals a hiatus about 2700 yr ago. The 2200–2300 and 2600–2700 cal BP events are also recorded in the KOKA segment, and the great earthquake at about 3200 cal BP may also be recorded there. This suggests that, although the PWS and KEN segments behave as a coherent unit of the Alaska megathrust, the KOKA segment is characterized by semi-independent behavior. At least 2, and perhaps as many as 4, of the last 7 prehistoric great earthquakes at this plate boundary did not propagate this far west.

INTRODUCTION

On 27 March 1964, abrupt release of strain at the interface of the Pacific and North American plates in southern Alaska produced the second largest earthquake of the 20th century ($M_w = 9.2$; Kanamori 1977). The main shock and attendant aftershocks ruptured an area extending from about 100 km east of the epicenter in Prince William Sound to just west of the Kodiak Archipelago, and inland from the Aleutian Trench to the northern shores of Cook Inlet and Shelikof Strait (Figure 1). Instantaneous coseismic deformation of the Alaska continental margin generated a Pacific-wide tsunami, which, in concert with local tsunamis produced by subaerial and submarine landslides, accounted for 106 of the 115 deaths attributed to this earthquake in Alaska (Lander 1996).

Geological evidence of similar episodes of abrupt crustal deformation during the late Holocene at the eastern end of the 1964 rupture zone suggests that the mean recurrence interval of great earthquakes is about 700–800 yr (Plafker et al. 1992; Combellick 1994; Plafker and Rubin 1994). The geologic record of paleoseismic activity at the western end of the Alaska subduction zone, however, is much more fragmentary (e.g. Davies et al. 1981). Consequently, important source parameters such as the rupture area and seismic moment of prehistoric plate-boundary earthquakes cannot yet be constrained.

The objective of this study is to attempt to reconstruct the chronology and rupture length of plate-boundary earthquakes at this subduction zone, by integrating published geological information on abrupt land-level changes with archaeological evidence of episodes of native village abandonment. The archaeological record along the southern Alaska coast represents a potentially rich, but essen-

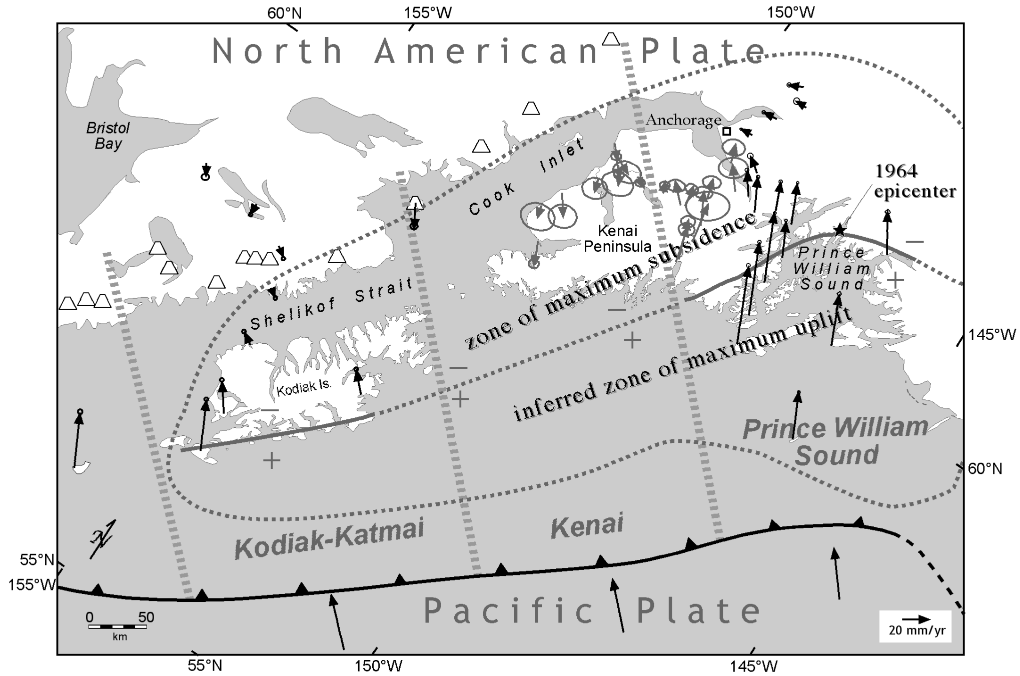

Figure 1 The Alaskan subduction zone showing the America-Pacific plate boundary (barbed black line) and areas of tectonic displacement in the 1964 earthquake. Light dashed lines mark the inferred boundaries of the tectonic segments proposed in this study. Arrows indicate current horizontal crustal velocities from GPS measurements (gray arrows show short-term campaign data). Cones mark arc volcanoes that have been active in Holocene time. (Sources of information: Plafker 1969; Plafker and Rubin 1992; Johnson et al. 1996; Freymueller et al. 2000; http://quake.wr.usgs.gov/research/deformation/gps/auto/NA.html; http://www.avo.alaska.edu/volcanoes/region.php/atlas.htm).

tially untapped source of information on the frequency and extent of catastrophic events in the prehistoric period.

We use a simple segmentation model of the Alaska subduction zone to explore the spatial and temporal patterns of paleoseismic activity from geologic evidence of land-level changes, and compare these patterns with discontinuities in occupation of coastal native villages. We also attempt to discriminate between seismic and non-seismic causes of village desertion and population exodus, in an attempt to expand our understanding of the incidence and effects of great earthquakes in this area.

TECTONIC SETTING AND SEGMENTATION OF THE ALASKA SUBDUCTION ZONE

Wesson et al. (1999) treated the 1964 rupture area as a coherent segment of the America-Pacific plate boundary in their evaluation of seismic hazard in Alaska. But, as they acknowledged, the real situation may be more complex; the 1964 earthquake may have propagated westwards across several adjacent segments of the Alaska subduction zone. If these segments consistently rupture in unison, then their seismic assessment is valid. If the segments primarily rupture independently, however, then the recurrence and magnitude of great earthquakes in southern Alaska need to be reevaluated.

No complete model of the tectonic structure of the Alaska subduction zone yet exists, but accumulating evidence suggests that the part of the plate boundary that slipped in 1964 likely comprises 3 segments. Pulpan and Frohlich (1985) initially named these the southern, central, and northeastern blocks, but there is still no consensus on their limits or nomenclature. We have adopted the 3-segment model as a working hypothesis, and refer to them as the Prince William Sound (PWS), Kenai (KEN), and Kodiak-Katmai (KOKA) segments (Figure 1).

The Prince William Sound segment comprises that section of the Alaska megathrust where the lower crust of the Yakutat terrane is welded to the underlying Pacific plate (Brocher et al. 1994). This composite slab is being subducted under the North America plate beneath Prince William Sound. The shallow dip (3–4°) of the subducting plate beneath the inner continental shelf is likely a product of the buoyancy of this mafic terrane. The 1964 earthquake nucleated here, and seismological investigations (Christensen and Beck 1994) and inversions of tsunami and geodetic data (Johnson et al. 1996) show that seismic slip was greatest in this area, likely as a result of higher coupling with the overlying plate.

The eastern boundary of the PWS segment coincides with the eastern limit of the 1964 rupture zone. This margin is marked by an absence of Wadati-Benioff Zone (WBZ) seismicity (Stephens et al. 1984). This "aseismic front" likely represents a tear or other discontinuity (the Yentna lineament of van Wormer et al. [1974]) in the subducting slab, effectively terminating eastward propagation of plate-boundary earthquakes. The western margin is more difficult to delineate. Although Brocher et al. (1994) contend that the sandwiched Yakutat terrane pinches out in the vicinity of the coastline, Ferris et al. (2003) speculate that the low-velocity zone they image to the east of Mt. McKinley represents the down-dip extension of this terrane. They note that if the inferred southern boundary of the terrane is extrapolated in the direction of plate convergence, then the down-dip extent lies at 100 km depth near Mt. McKinley. The subduction of continental terrane fragments in the area to the east of Mt. McKinley may also explain the absence of volcanic activity in this area.

Offshore, our proposed boundary between the PWS and KEN segments lies to the west of the magnetic anomaly on the continental shelf that may form the subducted southern margin of the Yakutat terrane (Griscom and Sauer 1990; Brocher et al. 1994). Onshore, we draw the boundary between the PWS segment and the KEN segment along the extrapolated western margin of the Yakutat terrane (Figure 1). This boundary neatly divides disparate regions of pre-1964 seismicity and post-1964 deformation on the Kenai Peninsula (Freymueller et al. 2000; Doser et al. 2004). Areas to the east currently display strong plate coupling, as indicated by crustal shortening and rapid post-seismic uplift (Figure 1).

Measurements in the aftermath of the 1964 earthquake and more recent investigations of seismic slip indicate that the KEN segment was only weakly coupled during the 1964 earthquake. The upper plate in this segment is currently moving trenchward (Figure 1) and is uplifting very slowly (Freymueller et al. 2000). The area down-dip of the 1964 rupture zone is undergoing rapid post-seismic creep (Freymueller et al. 2000). All of these indicators suggest that the plate interface in this segment is only weakly coupled at the present time (Freymueller et al. 2000).

We place the boundary between the KEN and KOKA segments midway between the western end of the Kenai Peninsula and the Kodiak Archipelago (Figure 1), but its precise location is poorly constrained. Onshore, the boundary is marked by a 20° change in the strike of the WBZ (Ratchovski and Hansen 2002), a concomitant adjustment in the orientation of the volcanic arc (Marsh 1979) and a change in eruptive products and vent spacing (Kay et al. 1982; Kienle and Swanson 1983). Given that our analysis simply compares geological and archaeological records in terrestrial areas on either side of the boundary, the precise location of this boundary beneath the continental shelf is not critical, and we consequently generalize it as shown in Figure 1.

The western limit of our proposed KOKA segment follows the boundary between the 1964 and 1938 (M_w = 8.2) rupture zones. This boundary is approximately concordant with the down-dip projection of the Aja fracture zone (von Heune et al. 1999), and is marked in the upper plate by an offset in the volcanic arc (Marsh 1979), likely as a result of a change in the dip of the subducting plate (Estabrook et al. 1994). No major earthquake has ruptured across this boundary in the last 200 yr (Estabrook et al. 1994), although Soloviev (1968) and Davies et al. (1981) suggest that 2 great earthquakes in 1788 ruptured the Kodiak segment along with the Alaska Peninsula and Shumagin segments to the west of the 1964 rupture zone. Crustal shortening is lower at sites in the KOKA segment than sites at similar distances from the convergent margin in the PWS segment, indicating that interplate coupling in the latter area is stronger (Figure 1).

GEOLOGICAL EVIDENCE OF PLATE-BOUNDARY EARTHQUAKES

In the aftermath of the 1964 earthquake, scientists associated with the United States Geological Survey (USGS) demonstrated that the spatial extent of fault rupture could be estimated from geological evidence of coseismic land-level change (Plafker 1965, 1969). Concomitant changes in local relative sea level allowed USGS investigators to document the magnitude of the deformation by measuring changes in the elevation of coastal biotic communities relative to tidal limits. Such evidence may be preserved in the sedimentary record and can be used to reconstruct the incidence of prehistoric plate-boundary earthquakes.

In areas close to the convergent margin, the upper plate was uplifted during the 1964 earthquake (Plafker 1965, 1969). In coastal areas exposed to severe wave action, the marine platform that developed during the preceding interseismic period was in some instances raised beyond the reach of the waves. Radiocarbon dating of organic materials in beach deposits or in the overlying terrestrial deposits on sequences of these relict marine terraces furnished an estimate of earthquake recurrence (Plafker and Rubin 1978). In more sheltered areas, such as lagoons and deltaic foreshores, great earthquake frequency can be established by dating the abrupt contacts between uplifted tidal flat deposits and overlying marsh or forest soils (Plafker et al. 1992).

In areas further removed from the plate boundary, the 1964 earthquake produced instantaneous subsidence (Plafker 1965, 1969). This is registered in many low-energy intertidal environments by an abrupt contact between the preseismic peaty soil and the tidal-flat mud that was deposited in the aftermath of subsidence. Earthquake recurrence is determined in these environments by dating sequences of peat-mud couplets in the sedimentary record.

The search for evidence of paleoseismic activity in southern Alaska in the aftermath of the 1964 Alaska earthquake by the USGS has been supplemented in the last few decades by investigations at more than 30 sites (Figure 2). We used these data to develop a great earthquake sequence for each site. We assume that all sedimentary contacts imputed to be of tectonic origin were correctly assigned. ^{14}C ages associated with gradual contacts and low-precision ages (quoted errors >150 yr) were rejected. Out-of-sequence ages and repetitive-sequence ages, often indicative of unstable sites such as slumped channel banks, were also eliminated from the database. We utilized published lithologic sequences and local crustal deformation patterns in the 1964 earthquake to determine the direction of land-level change at a site. Ages were then categorized as maximal (pre-earthquake) or minimal (post-earthquake). The resultant database is presented in Appendix A.

Most of the ages in the database are derived from bulk samples of peat taken immediately below the upper contact of a buried marsh or forest soil in areas inferred to have been subject to repeated coseismic subsidence. Peat accumulation in these subarctic marsh environments is relatively slow,

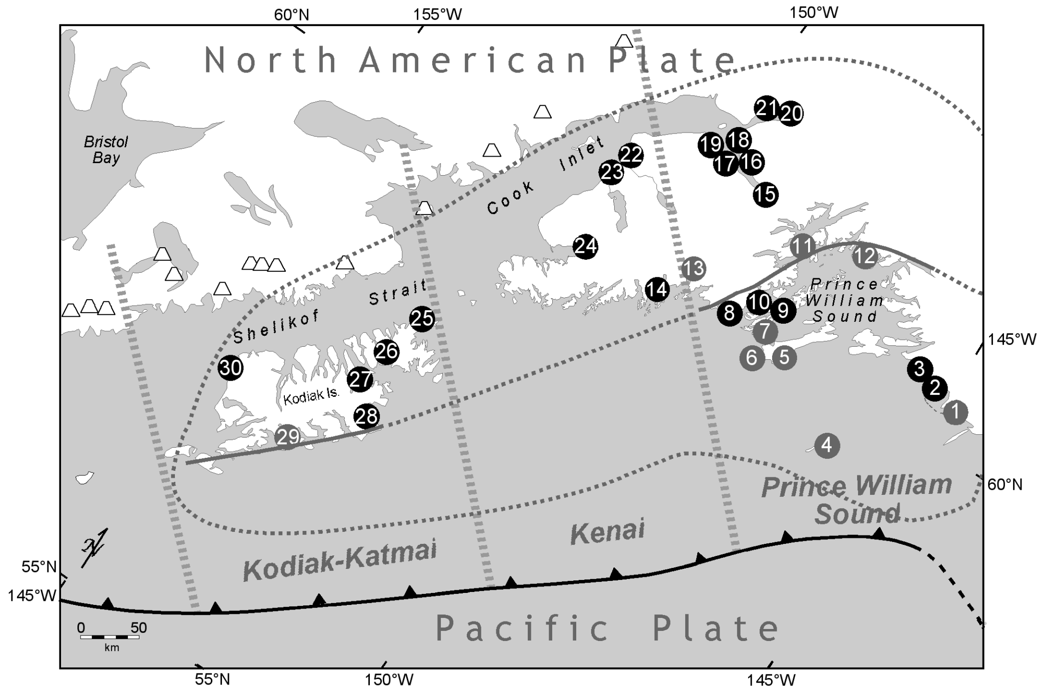

Figure 2 Sites in southern Alaska displaying geological evidence of abrupt prehistoric sea-level change. Black circles indicate sites with reliable data used in this analysis. Sites and sources: *Copper River delta*: 1. Katalla (Richards 2000) and Cape Suckling (Plafker 1969); 2. Copper River delta (Reimnitz 1966; Plafker 1990; Plafker et al. 1992; Plafker and Rubin 1994); 3. Eyak River and Little Glacier (Reimnitz 1966); 4. *Middleton Island* (Plafker 1969; Plafker and Rubin 1978). *Prince William Sound*: 5. MacLeod Harbor (Plafker 1969); 6. Patton Bay (Plafker 1969); 7. Latouche Island (Plafker 1969); 8. Puget Bay (Chaney 1997); 9. Knight Island (Chaney 1997); 10. Nowell Point (Plafker 1969) and Junction Island (Chaney 1997); 11. Perry Island (Plafker 1969); 12. Columbia Bay (Plafker 1969), Kenai Fjords; 13. Seward (Plafker 1969); 14. Aialik Bay (Mann and Crowell 1996). *Cook Inlet, Turnagain Arm*: 15. Portage (Combellick 1991; Bartsch-Winkler and Schmoll 1992); 16. Girdwood (Combellick 1991, 1993; Bartsch-Winkler and Schmoll 1992; Hamilton and Shennan 2005a); 17. Hope (Bartsch-Winkler and Schmoll 1992); 18. Ocean View, Anchorage (Bartsch-Winkler and Schmoll 1992; Hamilton et al. 2005) 19. Chickaloon Bay (Combellick 1991; Bartsch-Winkler and Schmoll 1992; Combellick and Reger 1994). *Cook Inlet, Knik Arm*: 20. Palmer Hay Flats (Combellick 1991); 21. Goose Bay (Combellick 1991; Combellick and Reger 1994). *Cook Inlet, Kenai Peninsula*: 22. Kenai River Flats (Combellick and Reger 1994; Hamilton and Shennan 2005b); 23. Kasilof River Flats and 24. Fox River Flats (Combellick and Reger 1994). *Kodiak Archipelago*: 25. Shuyak Island; 26. Afognak Island; 27. Anton Larsen Bay; 28. Chiniak Bay; 29. Sitkalidak Island; 30. Sturgeon Lagoon (sites 25–30: Gilpin 1995).

and the quoted mean ^{14}C age may therefore predate the earthquake by several decades. In these circumstances, trees or marsh plants killed by sudden salt-water immersion more accurately indicate the age of the subsidence event, and ^{14}C ages on tree stumps or plant macrofossils were therefore preferred over peat ages at sites where both were available.

Because of the slow rate of accumulation of organic matter, the basal peat horizons on uplifted marine surfaces yield mean ^{14}C ages that may postdate the uplift event by several decades, but in this case, ages from buried tree stumps (commonly spruce or hemlock in southern Alaska) are a less accurate indicator of the age of the earthquake. This is a function of the fact that coniferous trees represent a late stage in the ecological succession on the newly uplifted surfaces. No colonization by spruce or hemlock seedlings had taken place, for example, on the tidal flats at the Copper River delta that were raised above the high tide limit some 30 yr earlier (Thilenius 1990, 1995). Studies of successional sequences on deglaciated substrates in southern Alaska (Crocker and Major 1955) suggest that the development of mature conifers on the Copper River delta may take about a century. A comparison of bulk peat ages with ^{14}C ages on the outer rings or roots of tree stumps at the same stratigraphic level in areas of coseismic uplift indicates that the latter are on average about 80–120 yr younger than the peat. To incorporate this lag into the ^{14}C age, we added 100 yr to the quoted mean ^{14}C ages of tree stumps in horizons immediately overlying beach sand or intertidal mud.

The 100-yr correction was applied only in those cases where the stratigraphic position of the tree stump could be surmised from the description in the original field report. Although trees in coastal forests die from a variety of natural causes, in some cases death may be linked to later phases of the great earthquake tectonic cycle. On the Copper River delta, for example, surface areas that are raised during a great earthquake gradually subside into the intertidal zone during the interseismic phase of the earthquake cycle. As the surface drops below the high-tide limit, trees growing on the surface die and peat deposition ceases as marsh plants are killed by salt-water exposure. Thus, a relict tree stump at or below a gradational contact between peat and tidal flat mud does not indicate a seismic event, and these ages were eliminated from the database.

The corrected ^{14}C ages were converted to the sidereal calendar using the IntCal98 ^{14}C calibration data set of Stuiver et al. (1998). Probability density functions (PDFs) of individual calibrated ages (based on 50-yr intervals) were calculated from annual probability data generated by the CALIB 4.3 program (Stuiver and Reimer 1993). The PDFs of maximal and minimal ages bracketing inferred paleoseismic events were calculated using the minimal weighted range overlap procedure recommended by Biasi and Weldon (2003). This method estimates the true age of an event dated by multiple calibrated PDFs as $min(E_1(t), E_2(t), \ldots E_n(t))$, where n is the total number of maximal or minimal ^{14}C ages constraining event E.

A plot of the resultant constraining PDFs (Figure 3) shows a complex array of potential earthquake-bracketing ages. Although we recognize that even high-precision accelerator mass spectrometry (AMS) ages on in situ material at lithological contacts that can be unequivocally ascribed to coseismic crustal warping cannot prove that buried marsh soils at sites along hundreds of kilometers of coastline were submerged during a single great earthquake (Nelson 1992), we infer that concordant ages at neighboring sites are likely a product of the same event (or a series of closely spaced events). Conversely, discordant ages at neighboring sites are likely a product of independent ruptures, the geographical limits of which may coincide with segmentation of the subducting plate.

In addition to the great earthquake sequence derived from this analysis (Figure 3), we plot the chronology (2-σ ranges) developed by Plafker and Rubin (1994) from ages on post-seismic deposits at the Copper River delta. The raw ^{14}C ages associated with coseismic deformation from the 2 most recent earthquakes (prior to 1964) at this site were published by Plafker et al. (1992), and are incorporated into our PDF analysis in Figure 3; the raw ^{14}C ages of earlier events have not yet been published.

CHRONOLOGY OF GREAT EARTHQUAKES AT THE ALASKAN SUBDUCTION ZONE

The penultimate great earthquake at the Copper River delta, which occurred about 800 yr ago, is recorded at sites extending westward from the delta to the central coast of the Kenai Fjords National Park (Mann and Crowell 1996), and northward into upper Cook Inlet (Combellick 1991, 1993; 1994; Combellick and Reger 1994; Hamilton and Shennan 2005a,b; Hamilton et al. 2005). There is, however, no evidence that this earthquake propagated along the plate boundary to the west of this area (Figure 3).

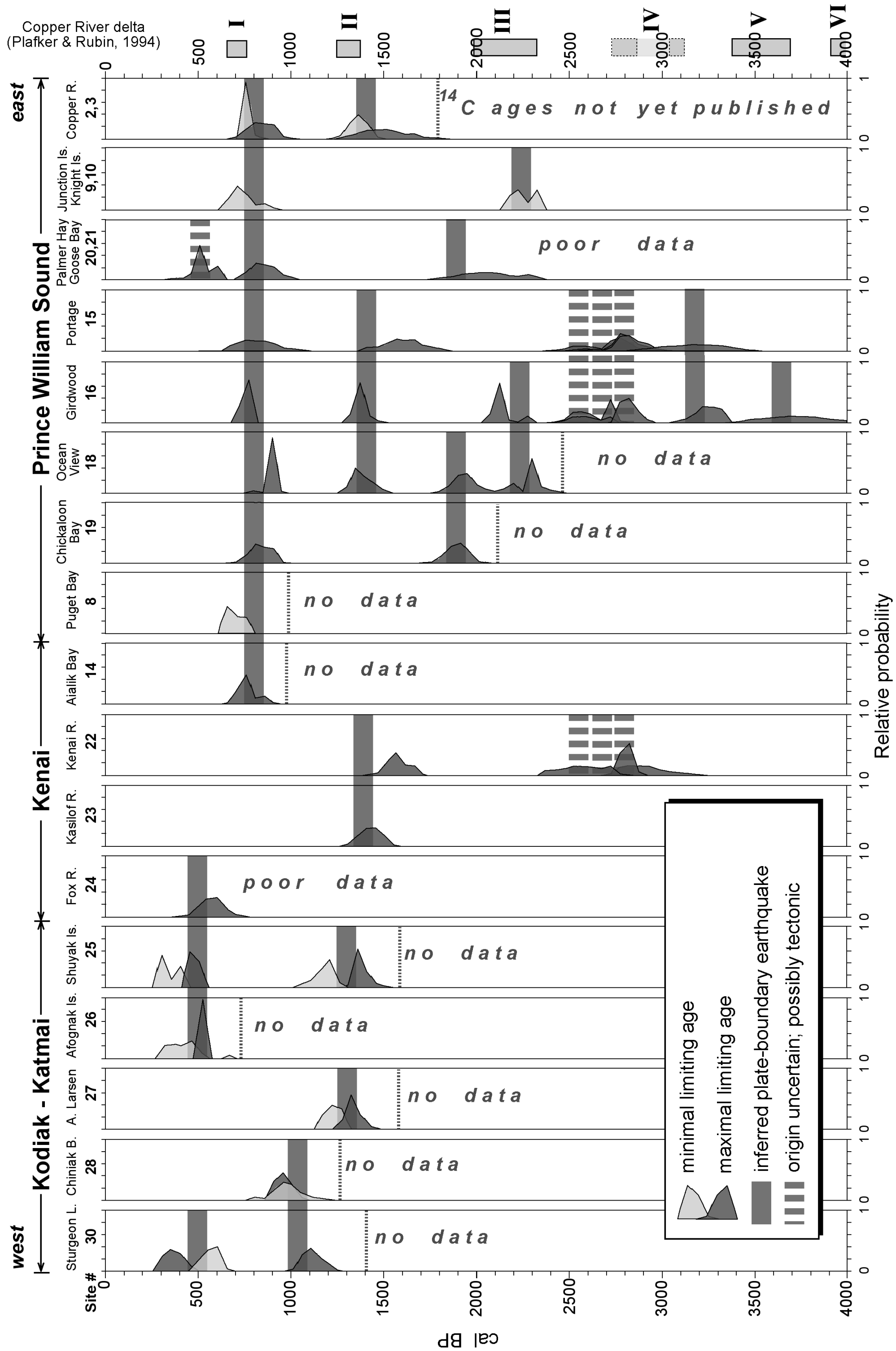

Figure 3 Ages of plate-boundary earthquakes at the Alaska subduction zone inferred from geological evidence of episodes of abrupt sea-level change. Site locations are shown in Figure 2. The thin dotted and hatched lines mark the maximum time-depth of evidence in each region. Periods beyond these limits are marked "no data."

The plate boundary in the western area (i.e. the Kodiak Archipelago) appears to have slipped most recently about 500 yr ago (Figure 3). Gilpin (1995) dates this event to about AD 1550, slightly later than our estimate. This rupture may have extended eastwards to Fox River Flats on the western Kenai Peninsula (Figure 3), but the sudden sea-level change recorded at Palmer Hay Flats and Goose Bay in Knik Arm in upper Cook Inlet at approximately the same time is puzzling.

There is localized evidence of land-level change on Kodiak Island about 1000 cal BP, but we concur with Gilpin (1995) that the previous great earthquake at the western end of the 1964 rupture area likely occurred about 1300 yr ago (Figure 3). Geological evidence of crustal deformation around this time is found from eastern Kodiak Island to the central part of the Kenai Peninsula.

This event may be contemporaneous with, or may have occurred shortly after, the antepenultimate earthquake (event "II" in the Plafker and Rubin [1994] chronology) recorded at the Copper River delta (Figure 3). Ages on uplifted tidal flats there and relict stumps in Prince William Sound and Puget Bay—along with buried marsh soils in Turnagain Arm, Kenai, and Kasilof River deltas—show that this earthquake occurred about 1400 yr ago (Figure 3).

According to Plafker and Rubin (1994), the preceding coseismic deformation event at the Copper River delta (their "III"; Figure 3) occurred about, or shortly before, 2000 to 2300 yr ago. There are buried peats dating from about 2200–2300 yr ago at Ocean View and Girdwood in Turnagain Arm, and relict stumps from this period in Prince William Sound (Figure 3), which suggest that a great earthquake likely ruptured at least the eastern segment of the Alaska megathrust at this time. At Ocean View, however, this peat is overlain by a marsh soil with an abrupt upper contact that dates from about 1900 yr ago (Figure 3). A buried soil of about the same age occurs on the western shore of Turnagain Arm, at Chickaloon Bay. The absence of evidence for this younger event from southern Turnagain Arm (Girdwood, Portage) and the Copper River delta is puzzling.

Similar uncertainties surround uplift event IV (Figure 3) at the Copper River delta. According to Plafker and Rubin (1994), this event occurred about 2800 to 3000 yr ago, but the AMS ^{14}C ages that they report from this event form 2 distinct subgroups (2750–2880 cal BP and 3050–3130 cal BP). Buried soils at Girdwood and Portage that date from ~3100–3200 yr ago (Combellick 1994) suggest that a great earthquake ruptured at least the eastern part of the Alaska subduction zone at this time. At some sites in southern Turnagain Arm, the buried soil from this event is overlain by 3 soils that predate event III at the Copper River delta. At both Girdwood and Portage, the oldest of these 3 soils contains tree stumps and detrital wood, and dates to ~2800 yr ago; i.e. akin to the younger cluster of AMS ages associated with event IV at the Copper River delta. The 2 younger soils are muddy peats and date from ~2500–2700 yr ago. An equivalent, essentially coeval stratigraphic sequence has been described at the Kenai River delta (Combellick and Reger 1994).

Given that the recurrence interval of inferred great earthquakes at the Alaska megathrust in the last 2500 yr averages about 700 yr (Figure 3), it seems unlikely that a segment of the subduction zone would rupture 3 times in ~300 yr. Do any of these 3 buried soils result from regional subsidence during a plate-boundary earthquake? Alternatively, are any the product of local movements on upper-plate faults, or do 1 or more represent non-tectonic forcings? For example, did isostatic loading or unloading during a Neoglacial period trigger rapid changes in relative sea level on the Kenai Peninsula?

The oldest coseismic uplift event recorded at the Copper River delta in the last 4000 yr dates from prior to 3400–3700 yr ago (Plafker and Rubin 1994; "V"). It is probably correlative with the lowest peat at Girdwood, which is dated by a single, low-precision ^{14}C age (Combellick 1991) to about 3500–3700 cal BP.

The geological data that are available for reconstructing the incidence of great earthquakes at the Alaska subduction zone are variable in quality and time-depth, and many questions remain about the age and extent of these events. While these uncertainties will almost certainly be reduced by further exploration of sensitive coastal sites, there is an untapped source of information that may clarify the paleoseismic record of this subduction zone. That data source consists of the stratigraphic records and ^{14}C chronologies of the archaeological sites that have been excavated around the margins of the Gulf of Alaska over the course of the last several decades.

THE ARCHAEOLOGICAL RECORD OF PALEOSEISMIC EVENTS IN SOUTHERN ALASKA

The archaeological record from the Gulf of Alaska holds considerable promise as a source of paleoseismic information, because the highest density of Alaskan native settlement was located along the shore, reflecting the maritime focus of the economy and the relative ease of travel by sea.

Coastal villages consisted of groups of semi-subterranean houses near the water, usually only a few meters above sea level (m asl). For example, the village at Palugvik on the south shore of Hawkins Island, in Prince William Sound, was situated on 2 tombolos bracketing a small bay (de Laguna 1956); and the village at Settlement Point on Afognak Island was located on the shore of a tidal lagoon (Figure 4; Saltonstall and Carver 2002). Not only were the people living in these locations at risk during a great earthquake from tectonic and landslide tsunamis, but villages may have been uninhabitable for decades after a great earthquake due to abrupt changes in relative sea level and loss of local food resources.

Extensive midden deposits, composed largely of discarded shellfish remains and other domestic refuse, mark the sites of former large villages such as Palugvik. Scattered house pits with thinly strewn cultural debris mark small villages and seasonal camps (de Laguna 1956, 1975; Mobley et al. 1990; Haggarty et al. 1991; Erlandson et al. 1992; Crowell 2000).

As Knecht notes, the middens of prehistoric coastal villages in the Kodiak Archipelago reveal "long periods of relative stasis and very brief periods of rapid change in an overall pattern of punctuated equilibrium" (1995:745). The most severe changes are marked by depositional breaks and culturally sterile strata, which indicate partial or complete abandonment of villages. The same pattern applies more broadly to phase transitions across the Gulf of Alaska (Erlandson et al. 1992; Mills 1994; Crowell et al. 2003). Temporal gaps in site occupation in this area may reflect cultural factors, such as warfare, or environmental causes, such as volcanic eruptions, river floods, global sea-level changes, local glacier advances, diseases, or loss of local food resources.

We suggest that the dominant cause of *widespread* village abandonment around the margins of the Gulf of Alaska was likely to have been plate-boundary earthquakes. The great Sumatra earthquake of 26 December 2004, for example, demonstrated that tectonic tsunamis, particularly when enhanced by coseismic subsidence, have tragic consequences for the people living on neighboring coasts. The survivors may move elsewhere—so both the date of initial occupation and of temporary or final abandonment of a settlement can be potential sources of paleoseismic information. Three native villages in the Kodiak Archipelago, for example, were severely damaged as a result of the subsidence and tsunamis generated by the 1964 earthquake. Two of these villages (Afognak, Kaguyak) were abandoned, and the survivors moved elsewhere (Plafker and Kachadoorian 1966; Saltonstall and Carver 2002).

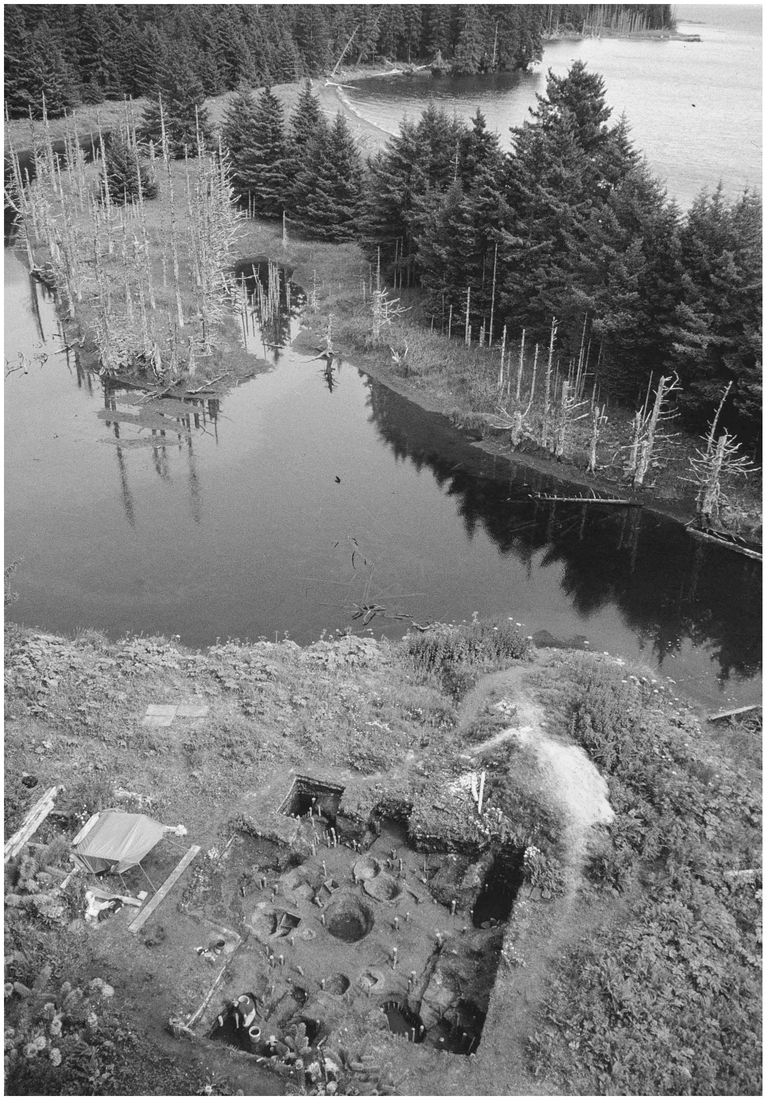

Figure 4 Excavation of a semi-subterranean house at the Settlement Point (AFG-015) archaeological site on Afognak Island. The dead spruce trees on the shore of the tidal lagoon were killed by salt-water exposure following >1 m of subsidence during the great earthquake of 1964. Photograph courtesy of Patrick Saltonstall.

In areas of net tectonic uplift, settlements may form a progressive, punctuated series on a staircase of relict back-beaches above the present shoreline. In contrast, coseismic subsidence may lead to flooding and erosion of old village sites. The archaeological record in these areas will consequently have limited time-depth as a result of site attrition (Crowell and Mann 1998; Saltonstall and Carver 2002).

This is not the first attempt to link paleoseismic and archaeological records in southern Alaska. For example, Winslow and Johnson state that there is "an inverse correlation between prehistoric settlement size and numbers and geologically inferred earthquakes" (1989:314) in the Shumagin Islands, which lie about 400 km to the west of the 1964 rupture. They argue that the size and number of sites were much reduced in the aftermath of great earthquakes, which produced gaps of 200 to 400 yr in the occupation sequence. Similarly, Maschner (1999) notes that there is a gap in the occupation of the lower Alaska Peninsula about 2200 to 2500 yr ago that is attributable to a major seismic event in the region, and Saltonstall and Carver (2002) show the impacts of previous great earthquakes on the village site at Settlement Point on Afognak Island. In addition, the transitions between cultural phases in southern Alaska may be a product of the socio-economic impacts of great earthquakes (Maschner 1995).

Whereas previous investigators have primarily attempted to integrate seismic and cultural history in Alaska to explain shifts in site tenancy and cultural traditions, our objective is the opposite; we contend that the rich archaeological archive of southern Alaska can shed light on the paleoseismic history of the region. This is a new approach in this region, and our interpretation of evidence is often speculative, but the success of this approach as a complement to geological investigations of paleoseismic activity at other convergent margins (e.g. Hutchinson and McMillan 1997; Goff and McFadgen 2001) is sufficient reason to apply it in southern Alaska.

The geoarchaeological approach to paleoseismology is rooted in the premise that changes in site tenancy as a result of seismic activity can be inferred from midden stratigraphy and from ^{14}C ages on cultural deposits (Hutchinson and McMillan 1997). If a village is abandoned in the immediate aftermath of a great earthquake, the midden should reveal stratigraphic evidence of rapid land-level change or inundation by high-energy waves. Where such direct evidence is absent, earthquake-related abandonment may be inferred if hiatuses in occupation are concurrent with known paleoseismic events.

Archaeological excavations normally expose only a small fraction of the village area, so we are commonly forced to derive site-wide conclusions from a limited spatial sample. Accumulation of material associated with houses, hearths, and food waste is evidence of site occupation, and closely spaced or overlapping ^{14}C ages derived from this cultural material likely reflects continuous occupation. Archaeologists rarely date culturally sterile strata in middens, and periods of abandonment must therefore generally be interpolated from limiting ages on bracketing cultural units. These periods may be apparent as gaps in the ^{14}C record, or veiled under the tails of ^{14}C age probability distributions associated with periods of occupation. Variation in the overall probability distribution of ^{14}C ages at a site or in a local area can thus serve as a proxy index for site activity.

In order to construct such a proxy, we compiled evidence from published and unpublished reports from excavated archaeological sites in the area that experienced abrupt land-level changes in 1964. We noted evidence of sterile layers (e.g. beach gravels, tephras, marsh peat, and forest soils) in midden stratigraphy, and developed a database of ^{14}C ages from these reports. These data were supplemented with information from an archaeological database covering the central and western parts of the 1964 earthquake area (http://faculty.washington.edu/fitzhugh/FitzHome.html).

We retained only those ^{14}C ages accepted by the original excavators (a few exceptions are noted) that were obtained on samples of charcoal or other terrestrial organics (thus avoiding the oceanic reservoir effect associated with marine organisms), and which had quoted errors of <150 yr. Elevated sites (>15 m asl) and those dating from the historic or protohistoric period (<300 ^{14}C yr BP) were also deleted from the database. The sites in each segment were divided into 2 groups ("outer" and "inner" coastal sites), based on our perception of the relative magnitude of the seismic hazard. Sites on outer coasts are at greater risk from tectonic tsunamis than those in more sheltered locations. The overall distribution of dated prehistoric sites is shown in Figure 5. The complete archaeological database is listed in Appendix B, and the maps in Appendix C show the locations of the dated sites in each segment.

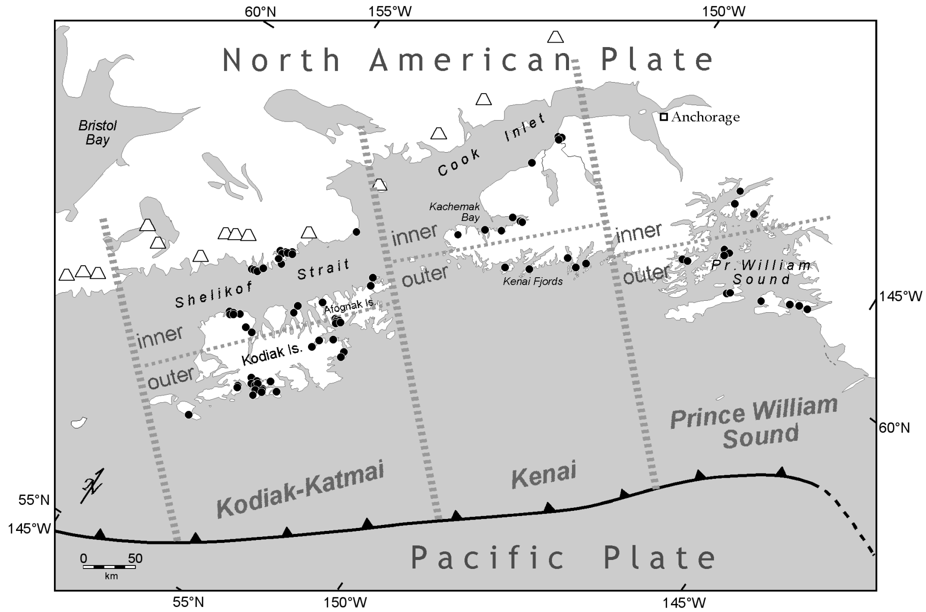

Figure 5 Locations of dated prehistoric coastal archaeological sites in southern Alaska relative to the Prince William Sound, Kenai, and Kodiak-Katmai tectonic segments. Sites in "outer" coastal locations have higher relative exposure to seismic and tsunami hazards.

Calibrated ages were derived from the ^{14}C ages using CALIB 4.3 (Stuiver and Reimer 1993). The calibrated age distributions from each site are graphed in Appendix D, and detailed site descriptions can be found in Hutchinson and Crowell (2006). Figure 6 shows the relative frequency distribution of calibrated ages (averaged over 50-yr intervals) in each group of sites. Probability density functions (PDFs) of all the calibrated ages from each group of sites (binned in 50-yr intervals) were calculated from annual data generated by CALIB 4.3. Because of the inherent non-linearity of the ^{14}C age-sidereal age relationship, we also calculated PDFs for each group of sites using randomly generated ^{14}C ages with the same relative frequency of ages per millennium, and the same distribution of error terms as in the raw data. The 90% confidence intervals for these random PDFs were calculated from 5 trial runs.

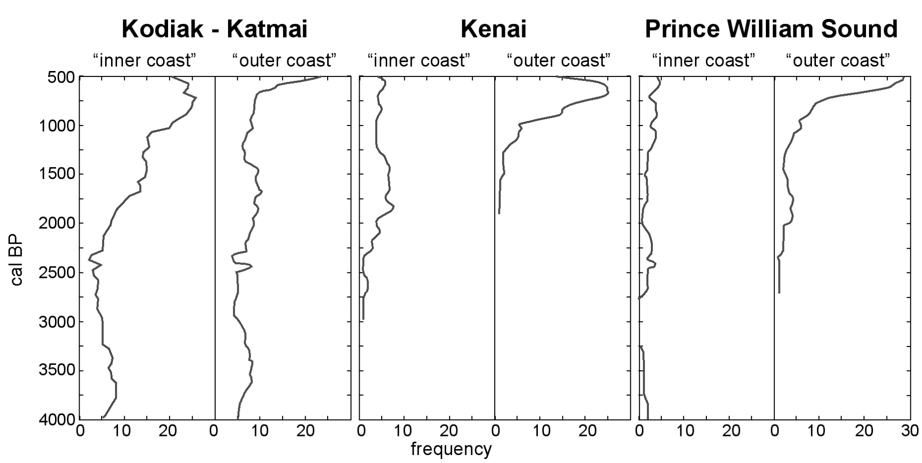

Figure 6 Mean frequency of composite calibrated ^{14}C ages in 50-yr intervals, from prehistoric "inner" and "outer" coastal archaeological sites in the Kodiak-Katmai, Kenai, and Prince William Sound tectonic segments.

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We argue that extreme variations of the observed value relative to the mean random ("expected") distribution (Figure 7a) represent an index of activity within a group of sites. Abrupt increases may represent episodes of colonization or resettlement, whereas rapid decreases may indicate widespread abandonment of villages or seasonal camps in a region.

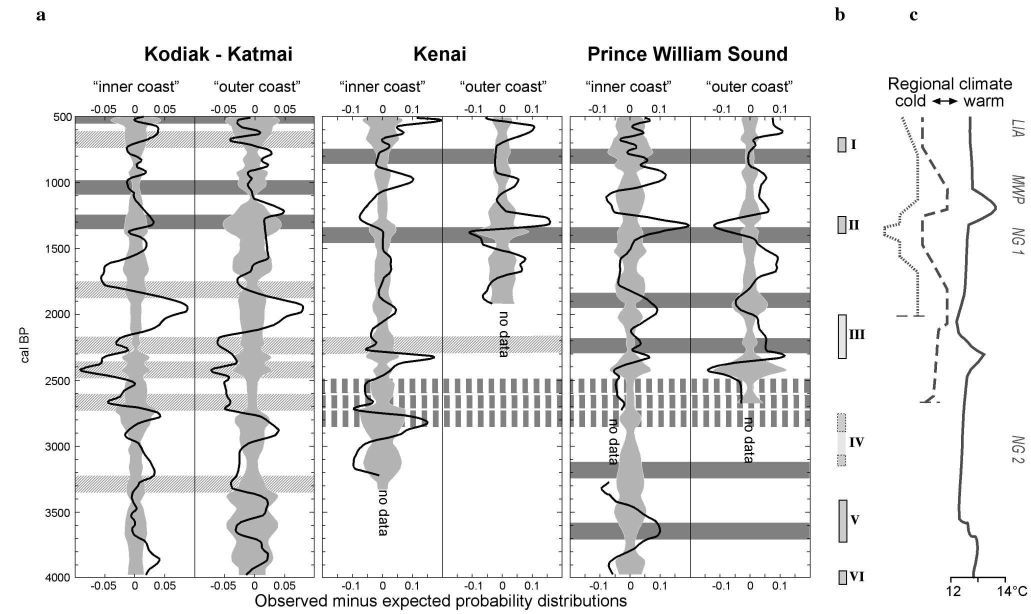

Figure 7 a) Variations in temporal probability distributions (black lines) of calibrated ^{14}C ages (binned in 50-yr intervals) from archaeological sites in the tectonic segment—coastal exposure units relative to the mean of 5 random runs for that unit. The 90% confidence interval envelopes for the randomly generated data are shown in light gray. Dark gray horizontal lines are estimates of the ages of prehistoric plate-boundary earthquakes, as inferred from geological evidence; vertically striped horizontal lines are ambiguous events (see Figure 3). Obliquely hatched horizontal lines indicate inferred episodes of abandonment of native villages (see text) that may be attributable to plate-boundary earthquakes; b) Minimum ages of inferred plate-boundary earthquakes at the eastern end of Alaska subduction zone, from Plafker and Rubin (1994); c) Paleotemperature proxies from southern Alaska. Dotted line: lake geochemistry, Alaska Range (Hu et al. 2001); dashed line: glacial advances and retreats, Gulf of Alaska (Calkin et al. 2001); solid line: pollen assemblages (mean July temperature, °C; Heusser et al. 1985). LIA = Little Ice Age; MWP = Medieval Warm Period; NG1 = Neoglacial 1; NG2 = Neoglacial 2.

DISCONTINUITIES IN SITE OCCUPATION IN THE PRINCE WILLIAM SOUND SEGMENT

The 17 precontact archaeological sites and site complexes that have been excavated in the area occupied by the PWS segment (Figure 5) have yielded 69 ^{14}C ages. The sites in the outermost part of the sound lie in the area that was uplifted during the great earthquake of 1964. The oldest sites in this area date from about 2500 yr ago, but most ^{14}C ages postdate the penultimate earthquake at about 800 cal BP (Figure 6). The site activity index from this area (Figure 7) shows only a modest downturn at this time, but the ^{14}C age distributions that fall in this period are derived from a single site (SEW-488; Appendix B). In contrast, a severe reduction in site activity occurred in the area about 1400 yr ago, at about the time of the penultimate great earthquake.

Localized geological evidence in Turnagain Arm suggests that the previous great earthquake in the PWS segment occurred about 1900 yr ago. The archaeological record from the outer coasts of Prince William Sound, however, suggests that this event had only a limited impact (Figure 7). The

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archaeological ^{14}C record prior to 2000 cal BP in this area is extremely meager, and no inferences can be drawn about site occupation or abandonment for this time period from this source.

Although dating control in the early prehistoric period is poor, the midden stratigraphy at sites with considerable time-depth suggests that great earthquakes may have had a strong influence on the history of settlement. At Palugvik, for example, a wooden artifact (P-173; Appendix B) dates an early occupation to ~2300–2500 cal BP; i.e. prior to the inferred plate-boundary earthquake that occurred ~2200–2300 cal BP. Frederica de Laguna, who excavated the Palugvik village site in the 1930s, rejected this date (de Laguna 1975), but we accept it on the basis of Yarborough and Yarborough's (1991) observation that the cultural materials are akin to artifact assemblages dating from this period at other sites in the area. This early prehistoric occupation is separated from a later component by a thin gravel layer, which might be the product of a tsunami generated by the great earthquake of 2200–2300 cal BP. This later occupation occurred in the interval between this event and the inferred great earthquake at ~1400 yr ago. The site was finally abandoned at about that time.

In addition, site SEW-440 on Eleanor Island "appears to have been occupied during 2 distinct time periods during the past 2 millennia" (Yarborough 1997:36). The stratigraphy of the test pits at this site also indicates a hiatus in site tenancy that lasted for several hundred years during the later period of occupation. The ^{14}C ages from this site can be grouped into 3 phases. The breaks between these phases correlate with inferred great earthquakes at 800 cal BP and 1400 cal BP.

^{14}C ages from the intact part of the midden at SEW-488 on Knight Island suggest that the site was occupied only in the aftermath of the 800 cal BP earthquake. Linda Yarborough (1997) notes that a thick organic deposit at the base of the site is interrupted by a sandy horizon. Although the origin of this horizon is unknown, bracketing ^{14}C ages from above (820 ± 60 BP [Beta-89048]) and below (910 ± 90 BP [Beta-89049] and 990 ± 60 BP [Beta-89050]) the sand layer imply that it may have been emplaced by the tsunami generated by the earthquake at ~800 cal BP.

The site occupancy pattern in the inner fjords of Prince William Sound is based largely on ^{14}C ages from the Uqciuvit village site (SEW-056), which lies on a sloping terrace just above a beach in the sheltered waters of Esther Passage. Fourteen of the 17 ^{14}C ages from this area are derived from this site. The site was initially occupied about 4400 yr ago, but was apparently unoccupied from ~3200–2500 yr ago, when local glaciers advanced to within 7 km of the site (Yarborough and Yarborough 1991).

A layer of gravel exposed in excavations near the beach separates 2 later occupations. The bracketing ^{14}C ages indicate that the gravel represents a beach formed following coseismic subsidence associated with the inferred great earthquake that occurred ~1400 cal BP. As the excavators of the site, however, note, "there is no evidence of a hiatus in occupation of the site corresponding with another earthquake about 850 years ago" (Yarborough and Yarborough 1991: 228). In fact, the activity index from Uqciuvit and the other sites in this area is almost a mirror image of the pattern from the outer coasts of Prince William Sound, with indications of enhanced activity at about the time of the great earthquakes (Figure 7). This suggests that sites in sheltered locations in the inner fjords, such as Uqciuvit, may have served as refuges for survivors displaced from villages in more exposed locations.

DISCONTINUITIES IN SITE OCCUPATION IN THE KENAI SEGMENT

Most of the excavated sites on the outer coast of the Kenai Peninsula (Figure 5) sit on relict beaches that appear to have formed in the aftermath of the penultimate earthquake about 800 yr ago (Crowell

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and Mann 1998). Consequently, virtually all of the 36 ^{14}C determinations from the sites in the Kenai Fjords postdate the earthquake (Figure 6). Some bear witness to earlier occupations (SEL-188, XBS-030; Appendix B), but the pattern of occupation in the region prior to the 800 cal BP earthquake cannot be reconstructed with any certainty, as few samples of older cultural materials have been dated. The ostensible downturn in site activity at the time of the great earthquake ~1400 yr ago (Figure 7) therefore cannot be reliably attributed to this event.

The geomorphic and archaeological impacts of the 800 cal BP great earthquake are evident at several sites. At Bear Cove (XBS-030), for example, the uppermost ^{14}C sample from the lowest archaeological stratum indicates that this occupation ended between 920–680 cal BP (2-σ limits, Beta-170797; Appendix B). This house floor is overlain by a gravel lens that is considered to form part of an overwash fan deposited by storm waves reworking an old beach that subsided during the earthquake (Mason 2006). Two ^{14}C samples from the house floor above the gravel lens (Beta-67273, Beta-67274; Appendix B) date this occupation to 660–535 cal BP, which indicates that the Bear Cove site was likely not re-occupied until relative sea level stabilized a century or more after the earthquake.

Nine ages from the upper midden at McArthur Pass (SEL-188; Appendices B, C, D) indicate that this site, like XBS-030, was re-occupied ~600–700 yr ago. A slightly imbricated layer of granite slabs, which may be a cultural artifact or a tsunami lag deposit, separates the upper midden from underlying cultural strata. ^{14}C determinations from the base of the lower midden suggest that SEL-188 was occupied for a short time ~1600 yr ago, and again—perhaps after a hiatus in the aftermath of an earlier great earthquake—about 1300 yr ago.

The sites on the shorelines of Kachemak Bay lie ~50 km arcward of the outer coast sites (Figure 5). Unlike the sites in the Kenai Fjords, however, only 1 of the 7 prehistoric sites that have been dated on the shores of the bay appears to have been settled in the aftermath of the 800 cal BP earthquake (SEL 027; Appendix B). Some sites (e.g. SEL-033 on Chugachik Island; Appendix B) have been occupied for much longer periods.

The settlement history of the bay shows several episodes of reduced activity in the last 3 millennia (Figure 7). The first of these began ~1400 yr ago. Although it is tempting to ascribe the apparent reduction in site activity to the great earthquake that occurred at about this time, the downturn is gradual, and may have had other causes. The second hiatus is concordant with the plate boundary earthquake at 2200–2300 cal BP, and the third appears to be coincident with the 2nd of the closely spaced events that date to ~2500–2900 cal BP.

The archaeological sites on the shores of central Cook Inlet (>300 km from the convergent margin; Figure 5) are camps established by Dena'ina people from the interior of Alaska within the last 600 yr (Reger 1987; Reger and Boraas 1996). Because of their limited time-depth, these sites contribute little to an analysis of great earthquake incidence and are not considered further.

DISCONTINUITIES IN SITE OCCUPATION IN THE KODIAK-KATMAI SEGMENT

The temporal pattern of prehistoric settlement on the outer coasts of Kodiak Island and its neighbors (Afognak, Sitkalidak, and the Trinity Islands) is constrained by 76 ^{14}C ages from 30 archaeological sites. According to the ^{14}C record (Figure 7), there have been 4 major downturns in site activity in this area in the last 4000 yr. These occurred approximately 700, 1900, 2700, and 3300 yr ago. Other, minor reductions in site activity began ~2300 and 2500 yr ago.

Settlement Point (AFG-015), a small village located on a tidal lagoon on the south shore of Afognak Island (Figure 4), illustrates the shifts in settlement patterns in this area that may be attributable to catastrophic earthquakes (Saltonstall and Carver 2002). Two ^{14}C ages (570 ± 60 ^{14}C yr BP [Beta-118330], and 620 ± 50 ^{14}C yr BP [Beta-101551]; Appendix B) suggest that the oldest excavated house at the site (Figure 4) was built shortly after 650 cal BP. The house sits on a beach that formed following coseismic subsidence. The apparent downturn in site activity that begins ~700 yr ago in the KOKA segment (Figure 7) suggests that the house may have been built a few decades after a great earthquake that was restricted to this segment of the plate interface.

The "inner coast" sites of the KOKA segment lie on the northern shores of Kodiak, Afognak, and Shuyak islands, and the Katmai coast on the northern margin of Shelikof Strait (Figure 5). The southern shores of the strait experienced moderate amounts of coseismic deformation and tsunami run-up in 1964, but land-level changes and tsunami run-up on the northern shore were negligible (Plafker 1969).

Almost 100 ^{14}C ages have been published from the testing or excavation of 30 prehistoric sites on this coast (Crowell and Mann 1996; Crowell et al. 2003). Most of the ^{14}C ages date occupations during the last 1500 yr, but a considerable number of ^{14}C determinations are available from earlier times.

The resultant probability distribution (Figure 7) correlates strongly with that from the outer coast of the KOKA segment, suggesting that changes in the temporal pattern of occupation had a common cause. We identify 3 major reductions in archaeological site activity on the inner coast (Figure 7), beginning at ~1900, 2500, and 2700 cal BP. The descriptions of midden stratigraphy in the archaeological literature, however, suggest that earthquakes and their attendant tsunamis have impacted some sites much more recently.

One such site is New Karluk (KAR-001), located on a spit at the mouth of Karluk Lagoon on the northwest coast of Kodiak Island. The 4-m-thick midden at this site overlies an old beach. The midden is comprised of old wooden house floors and collapsed sod roofs, plus food refuse. Eight ^{14}C ages indicate that the site has been occupied for about the last 800 yr. A 4-cm-thick layer of sterile gravel overlies the lowest cultural deposits (Jordan and Knecht 1988; Knecht 1995). Bracketing ages on successive floors of a single house (Beta-25599 and Beta-15016; Appendix B) indicate that the gravel (which the original excavators inferred to be a tsunami deposit) was emplaced about 600–700 yr ago.

Tsunami deposits may also be preserved in the middens of abandoned villages on the Katmai coast. For example, a test pit in a 1-m-thick midden near Cape Gull (XMK-058) revealed a layer of beach cobbles up to 0.2 m thick between 2 occupation layers, the lower of which is also underlain by cobbles (Dekin et al. 1993). The basal cobble layer was deposited prior to 650 cal BP (GX-17006/7 and GX-17008/9; Appendix B), and may be a relict beach or tsunami deposit. This may be correlative with the inferred tsunami deposits or beach facies at archaeological sites on the southern shore of Shelikof Strait. The upper beach cobble layer, which is bracketed by 2 split pairs of ^{14}C ages (GX-17006/7 and GX-17008/9; Appendix B), dates from the interval between 510–650 yr ago, and may have been laid down by the tsunami associated with the inferred earthquake at about 500 cal BP (Gilpin 1995).

DISCUSSION AND CONCLUSIONS

Geological Evidence of Great Earthquakes

Plafker and Rubin (1994) proposed a chronology of great earthquake incidence at the Alaskan subduction zone based on evidence of coseismic uplift from the Copper River delta, close to the eastern boundary of the 1964 rupture zone. They furnish a minimum age for each earthquake by dating organic materials deposited shortly after each episode of coseismic uplift. Our analysis of depositional sequences associated with coseismic deformation at other sites in the 1964 rupture zone suggests that the Copper River delta earthquake chronology is likely also applicable in Prince William Sound, adjacent parts of the Kenai Fjords region, and upper Cook Inlet (Figure 3). ^{14}C determinations from organics deposited shortly before the earthquake in these areas (Combellick 1991, 1993; 1994; Combellick and Reger 1994; Hamilton and Shennan 2005a,b) suggest that the 1964 great earthquake was preceded by similar events occurring approximately 800, 1400, 2200–2300, 3200, and 3600–3700 yr ago. There is also ambiguous evidence for a great earthquake about 1900 yr ago, and a series of 3 closely spaced events between 2500–2850 yr ago.

It is less certain, however, that this chronology is applicable in areas further to the west. This is due, in part, to the paucity and low caliber of the geological evidence in some of these areas. For example, the eastern shore of central and lower Cook Inlet subsided by about 0.5 m in 1964 (Plafker 1969), and the geological imprint of previous coseismic land-level changes should therefore be visible in the tidal marshes of the deltas of the Kenai, Kasilof, and Fox rivers. But evidence of small land-level changes in high-energy deltas can be readily removed or overprinted by riverine floods and channel avulsions, and these tidal marshes exhibit complex depositional sequences as a result of interactions between these processes (Combellick 1994; Combellick and Reger 1994). The patchy geological evidence from these deltas means that the history of great earthquakes in this area is less well known than in areas further east. Although the great earthquakes at ~1400 cal BP and 2700–2800 cal BP seem to be registered in the stratigraphic archives at the Kenai delta, neither the 800 cal BP nor the 2200–2300 cal BP events are strongly recorded there.

In the Kodiak Archipelago, geological evidence of coseismic subsidence at about 500 cal BP appears to be fairly widespread (Figure 3). An intervening event appears in the record on Kodiak Island, at approximately 1000 cal BP. In these western reaches of the Alaskan subduction zone, however, the geological record is limited to the last 1500–1600 yr, and the incidence of prior great earthquakes cannot be determined.

Archaeological Evidence of Great Earthquakes

As acknowledged earlier, an exodus or local population decline that might give rise to a reduction in the site activity index may be triggered by factors other than tectonic forcings. Climate change, volcanism, disease, warfare, and ecological collapse can all have deleterious impacts on human populations and settlements. In southern Alaska, we have independent evidence of the functioning of only 1 of these alternative potential causes: climate change.

Patterns of Late Holocene climate change in southern Alaska have been reconstructed from several proxies for paleotemperature, such as pollen accumulation (Heusser et al. 1985), glacier margin fluctuations (Calkin et al. 2001), and lake geochemistry (Hu et al. 2001). These proxies suggest that there have been 3 periods of climatic deterioration in the Gulf of Alaska region in the last 4000 yr (Figure 7c). It is likely that camps near fjord heads were abandoned during each of these phases as glaciers advanced.

Unfortunately, the phases of glacial advance and retreat in southern Alaska often display local variations and are not tightly dated. The fluctuations in Late Holocene climate reconstructed by Heusser et al. (1985), Calkin et al. (2001), and Hu et al. (2001) are in broad agreement, but may be out of phase by several centuries, so the potential effects of climatic variation on site habitability are difficult to determine. What is apparent, however, from a comparison of the common parts of the archaeological and palaeotemperature records in Figure 7, is that "activity" at coastal village sites was controlled in part by the direct and indirect effects of Holocene climate change in the Gulf of Alaska. For example, the apparent reduction in site activity in the KOKA segment, and the apparently sparse occupation in the KEN and PWS segments in the interval from ~3500 to ~2300 cal BP may be correlated with climatic deterioration during a neoglacial episode ("NG2"; Figure 7c). A more recent climatic deterioration ("NG1"; Figure 7c) appears to have had less extreme consequences.

While we recognize that non-tectonic processes undoubtedly influenced the populations of coastal villages, we suggest that correlative short-term changes in archaeological site activity may mark the catastrophic effects of plate-boundary earthquakes.

The penultimate great earthquake at the eastern end of the subduction zone, which occurred about 800 yr ago, apparently led to the widespread destruction and abandonment of settlements as far west as Kachemak Bay. Some archaeological sites in the KOKA segment show evidence of a hiatus about 1 or 2 centuries later. Sand and gravel layers in middens on either side of Shelikof Strait were likely emplaced by the tsunamis that accompanied this later event. We tentatively conclude that the KOKA segment ruptured independently of the PWS and KEN segments ~650 yr ago. A younger event, at ~500 cal BP (Gilpin 1995), lies too close to the prehistoric/protohistoric threshold to be resolved by our analysis.

Sites on the outer coast of the PWS segment record a downturn associated with an inferred plate-boundary earthquake at, or shortly after, 1400 cal BP (Figure 7). Although there is evidence of a hiatus in occupation at the McArthur Pass site at about that time, there are too few dated sites on the outer coast of the KEN segment to resolve the effects of the earthquake in this area, and although the sites in Kachemak Bay show a downturn in activity at that time, the change is gradual and may not have been triggered by a great earthquake. Sites in the inner reaches of Prince William Sound show a dramatic increase in activity at about that time, suggesting that this area may have been a haven for people displaced from the outer coast. There is little evidence of disruption in the archaeological record at sites in the KOKA segment at that time, suggesting that this earthquake, like the one at ~800 cal BP, was limited to the KEN and PWS segments. The KOKA segment of the plate interface apparently slipped some 100–200 yr later. This event is not strongly recorded in the KOKA site activity index (Figure 7), but is reflected in midden stratigraphy, particularly at sites on the southern shore of Afognak Island.

A marked downturn in the site activity index in the KOKA segment after 1900 cal BP (Figure 7) may signal the next great earthquake in the sequence. Buried soils dating from about or shortly after 1900 yr ago are present at some sites in Turnagain Arm (Figure 3), but no correlative uplift episode is known from the Copper River delta. Minor downturns in the site activity indices in KEN and the outer coast sites in PWS may be a product of this event.

Possible tsunami deposits at an outer coast site in PWS may record the great earthquake at the eastern end of the subduction zone at ~2200–2300 cal BP, but the ^{14}C record prior to 2000 yr ago is too meager to allow the activity pattern at these sites to be reconstructed with any certainty. The dramatic downturn in the site activity index in Kachemak Bay (Figure 7) implies that the 2200–2300 cal BP event may have had a severe impact on villages in this area. The site activity index from the

KOKA segment also shows a slight downturn at this time (Figure 7), implying either that the earthquake propagated this far west, or that some sites were affected by tsunamis generated by this event. A further downturn in the index in the KOKA site activity index at ~2400 cal BP may represent the effects of an earthquake restricted to this segment.

A region-wide downturn in the site activity index from the KOKA and KEN segments ~2600–2700 yr ago (Figure 7) may well represent the after-effects of the first or second of the 3 potential subsidence episodes recorded at about this time by buried soils in Turnagain Arm and Kenai River delta. This event is likely contemporaneous with an episode of uplift at Copper River delta represented by the younger group of AMS ages associated with event IV in the Plafker and Rubin (1994) chronology (Figure 3).

The episode of uplift at Copper River delta represented by the older AMS age associated with event IV in the Plafker and Rubin (1994) chronology, and by buried soils in Turnagain Arm (Figure 3), is matched by a downturn in the activity index at sites on the outer coasts of the KOKA segment (Figure 7), suggesting that a rupture ~3200 yr ago may have propagated as far west as Kodiak Archipelago.

On the basis of the archaeological evidence, we propose that at least 3 of the prehistoric great earthquakes recorded in the stratigraphic archives at the eastern end of the Alaska subduction zone may have ruptured the entire Alaska plate boundary, and were therefore likely equivalent in magnitude to the 1964 earthquake. These events occurred approximately 2200–2300, 2600–2700, and 3100–3200 yr ago. Two great earthquakes (at ~800 cal BP and, with less certainty, the event at ~1400 cal BP) appear to have been restricted to the KEN and PWS segments. Several great earthquakes (e.g. at ~600–700 cal BP) appear to have been restricted to the KOKA segment, and the rupture area of the inferred great earthquakes at ~1900 cal BP and 3600–3700 cal BP remains undetermined.

It is apparent from this discussion that, although there are still local ambiguities and discrepancies that need to be resolved at the eastern end of the Alaska subduction zone, the great earthquake chronology derived from episodes of abrupt uplift at the Copper River delta is generally applicable as far west as the Kenai Peninsula. This suggests that the PWS and KEN segments generally behave as a coherent unit of the Alaska megathrust. Geological evidence and ancillary archaeological data indicate that the KOKA segment is characterized by semi-independent behavior, and at least 2, and perhaps as many as 4 of the last 7 prehistoric great earthquakes at this plate boundary did not propagate this far west. In addition, this area may generate large or great earthquakes independently of areas further east—perhaps in concert with adjacent segments of the Aleutian subduction zone. If these inferences are correct, then the behavior of the Alaska subduction zone is more complex than is generally recognized, and this should be accommodated in seismic hazard assessments for the area.

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Appendix A ^{14}C ages constraining inferred great earthquakes at the Alaska subduction zone.

Site #	Location	Original site code (if known)	Land-level change in 1964?	Site sequence #	Relation to quake (pre/post/unknown)	Lab # [or sample #]	^{14}C age	1-σ error	Material dated	Reference	**Accept / Reject** [Reason for rejection]
1	Cape Suckling		Up		post?	W-376	390	160	rooted stump	Plafker 1969	Reject [low precison]
1	Cape Suckling		Up		post?	W-1792	710	200	rooted stump	Plafker 1969	Reject [low precison]
1	Katalla		Up		post?	—	440	90	rooted stump	Sirkin & Tuthill 1972, in Richards 2000	Reject [stratigraphic position unknown]
1	Katalla		Up		post?	—	1100	100	wood	Sirkin & Tuthill 1972, in Richards 2000	Reject [stratigraphic position unknown]
1	Katalla		Up		post?	—	1230	90	peat	Sirkin & Tuthill 1972, in Richards 2000	Reject [stratigraphic position unknown]
1	Katalla		Up		post?	I-7	3770	200	peat	Plafker 1969	Reject [low precison]
2	Copper R. delta - Cudahy Slough		Up	II	post	LJ-938	700	30	rooted stump	Reimnitz 1966	Accept
2	Copper R. delta-Pete Dahl Cutoff		Up	II	post	LJ-GAP 0032	700	50	rooted stump	Reimnitz 1966, in Plafker 1969	Accept
2	Copper R. delta-Alaganic Slough		Up	II	post	LJ-939	725	30	rooted stump	Reimnitz 1966	Accept
2	Copper R. delta-Alaganic Slough		Up	II	post	W-6102	830	60	peat	Plafker et al. 1992; p.c 2000	Accept
2	Copper R. delta-Alaganic Slough		Up	II	pre	W-6098	960	60	Carex	Plafker et al. 1992; p.c. 2000	Accept
2	Copper R. delta-Alaganic Slough		Up	III	post	W-6088	1500	80	peat	Plafker et al. 1992	Accept
2	Copper R. delta-Alaganic Slough		Up	III	pre	W-6085	1610	110	Carex	Plafker et al. 1992	Accept
2	Copper R. delta-Pete Dahl Cutoff		Up	III	post	LJ-GAP 0034	1700	100	rooted stump	Reimnitz 1966	Reject [sig. diff. from other ages at this contact]
3	Little Glacier		Up	?	post	LJ-GAP 0033	860	50	rooted stump	Reimnitz 1972	Accept
3	Eyak River		Up	?	post	LJ-943	1360	50	rooted stump	Reimnitz 1966	Accept

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Appendix A ^{14}C ages constraining inferred great earthquakes at the Alaska subduction zone. *(Continued)*

Site #	Location	Original site code (if known)	Land-level change in 1964?	Site sequence #	Relation to quake (pre/post/unknown)	Lab # [or sample #]	^{14}C age	1-σ error	Material dated	Reference	**Accept / Reject** [Reason for rejection]
4	Middleton Is.		Up	II	post	W-1724	1350	200	wood	Rubin & Alexander 1958, in Plafker 1969	Reject [low precision]
4	Middleton Is.		Up	III	post	W-1401	2390	200	wood	Rubin & Alexander 1958, in Plafker 1969	Reject [low precision]
4	Middleton Is.		Up	VII?	post	W-1405	4470	250	wood	Rubin & Alexander 1958, in Plafker 1969	Reject [low precision]
5	PWS - Montague Is - MacLeod Harbor		Up		post?	W-1764	380	200	rooted stump	Plafker 1969	Reject [low precision]
5	PWS - Montague Is - MacLeod Harbor		Up		post?	W-1590	560	200	rooted stump	Plafker 1969	Reject [low precision]
6	PWS - Montague Is - Patton Bay		Up		post?	W-1766	600	200	wood	MJ Kirkby, p.c. in Plafker 1969	Reject [low precision]
6	PWS - Montague Is - Patton Bay		Up		post?	W-1770	2070	200	peat	MJ Kirkby, p.c. in Plafker 1969	Reject [low precision]
7	PWS - LaTouche Island		Up		post?	W-1591	230	200	rooted stump	Plafker 1969	Reject [low precision]
8	Kenai Peninsula-Puget Bay	30	Up		unknown	Beta-79474	130	50	rooted stump (wood)	G Chaney, in Yarborough 1997	Reject [bayhead bars of hybrid tectonic-fluvial origin?]
8	Kenai Peninsula-Puget Bay	27	Up		unknown	Beta-79471	290	40	rooted stump (wood)	G Chaney, in Yarborough 1997	Reject [bayhead bars of hybrid tectonic-fluvial origin?]
8	Kenai Peninsula-Puget Bay	29	Up		post?	Beta-79473	480	60	driftwood	G Chaney, in Yarborough 1997	Reject [bayhead bars of hybrid tectonic-fluvial origin?]
8	Kenai Peninsula-Puget Bay	26	Up	?	post?	Beta-79470	670	40	rooted stump (wood)	G Chaney, in Yarborough 1997	Accept
8	Kenai Peninsula-Puget Bay	28	Up		post?	Beta-79472	790	60	rooted stump (wood)	G Chaney, in Yarborough 1997	Reject [bayhead bars of hybrid tectonic-fluvial origin?]

Appendix A ^{14}C ages constraining inferred great earthquakes at the Alaska subduction zone. *(Continued)*

Site #	Location	Original site code (if known)	Land-level change in 1964?	Site sequence #	Relation to quake (pre/post/unknown)	Lab # [or sample #]	^{14}C age	1-σ error	Material dated	Reference	**Accept / Reject** [Reason for rejection]
9	PWS- Knight Island	(near SEW-488-18)	Up	?	post?	Beta-79463	2120	40	peat	G Chaney, in Yarborough 1997	Reject [stratigraphy unknown]
9	PWS- Knight Island	(near SEW-488-5)	Up	?	post?	Beta-79453	2510	60	rooted stump (bark)	G Chaney, in Yarborough 1997	Reject [stratigraphy unknown]
9	PWS- Knight Island	(near SEW-488-6)	Up	?	post?	Beta-79454	2770	60	peat (under sample 5)	G Chaney, in Yarborough 1997	Reject [stratigraphy unknown]
9	PWS- Knight Island	(near SEW-488-7)	Up	?	post?	Beta-79456	2820	80	rooted stump (wood)	G Chaney, in Yarborough 1997	Reject [stratigraphy unknown]
9	PWS- Bay of Isles	25	Up	?	post?	Beta-79469	2940	50	rooted stump (wood)	G Chaney, in Yarborough 1997	Reject [rooted well above base of forest soil]
9	PWS- Bay of Isles	(near SEW-488-23)	Up	?	post?	Beta-79467	4230	70	peat (above tsunami sand)	G Chaney, in Yarborough 1997	Accept [tsunami record]
9	PWS- Bay of Isles	(near SEW-488-22)	Up	?	post?	Beta-79468	4530	70	peat (below tsunami sand)	G Chaney, in Yarborough 1997	Accept [tsunami record]
10	PWS- Junction Island	16	Up	?	post?	Beta-79462	730	50	rooted stump (wood)	G Chaney, in Yarborough 1997	Accept
10	PWS- Nowell Point		Up	?	post?	W-1588	930	200	wood in peat on beach	Plafker 1969	Reject [low precision]
10	PWS- Junction Island	15	Up	?	post?	Beta-79461	2160	40	rooted stump (wood)	G Chaney, in Yarborough 1997	Accept
11	PWS- Perry Is.		Up	?	post?	W-1589	3680	300	rooted stump	Plafker 1969	Reject [low precision]
12	PWS - Columbia Bay		Up		post?	W-1592	1140	250	rooted stump	Plafker 1969	Reject [low precision]

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Appendix A ^{14}C ages constraining inferred great earthquakes at the Alaska subduction zone. *(Continued)*

Site #	Location	Original site code (if known)	Land-level change in 1964?	Site sequence #	Relation to quake (pre/post/ unknown)	Lab # [or sample #]	^{14}C age	1-σ error	Material dated	Reference	**Accept / Reject** [Reason for rejection]
13	Seward		Down		post?	W-1720	~200	—	rooted stump	Plafker 1969	Reject [precision unknown]
14	Kenai Peninsula-Aialik Bay		Down	II	pre	Beta-74353	780	60	rooted stump	Mann & Crowell 1996	Accept
14	Kenai Peninsula-Aialik Bay		Down	II	pre	Beta-65022	810	50	rooted stump	Mann & Crowell 1996	Accept
14	Kenai Peninsula-Aialik Bay		Down	II	pre	Beta-67121	890	70	rooted stump	Mann & Crowell 1996	Accept
14	Kenai Peninsula-Aialik Bay		Down	II	pre	Beta-67122	900	50	rooted stump	Mann & Crowell 1996	Accept
14	Kenai Peninsula-Aialik Bay		Down	II	pre	Beta-67123	920	50	rooted stump	Mann & Crowell 1996	Accept
14	Kenai Peninsula-Aialik Bay		Down	II	pre	Beta-65024	940	80	rooted stump	Mann & Crowell 1996	Accept
15	Turnagain Arm-Portage	TA8-12.7	Down	II	pre	GX-15218	885	120	peat	Combellick 1991	Accept
15	Turnagain Arm-Portage	TA8	Down	III?	pre	GX-15404	1495	165	peat	Combellick 1991	Reject [low precision]
15	Turnagain Arm-Portage	TA8	Down	IV?	pre	GX-15219	1695	80	peat	Combellick 1991	Accept
15	Turnagain Arm-Portage	TA8	Down	V?	pre	GX-15405	2630	80	peat	Combellick 1991	Accept
15	Turnagain Arm-Portage	TA8	Down	V?	pre	GX-15220	2675	80	peat	Combellick 1991	Accept
15	Turnagain Arm-Portage	TA8	Down	V?	pre	GX-15221	2705	85	peat	Combellick 1991	Accept
15	Turnagain Arm-Portage	TA8	Down	VI?	pre	GX-15222	3015	140	peat	Combellick 1991	Accept
15	Turnagain Arm-Portage	TA8	Down	VII?	pre	GX-15223	4150	130	peat	Combellick 1991	Accept
16	Turnagain Arm-Girdwood	92-31-2.1	Down		pre	Beta-50338	600	70	peat	Combellick & Reger 1994	Reject [disturbed profile]
16	Turnagain Arm-Girdwood	A-1	Down		pre	W-175	700	250	rooted stump	Karlstrom 1964	Reject [low precision]
16	Turnagain Arm-Girdwood	92-19-4	Down	II	pre	Beta-54604	730	50	peat	Combellick & Reger 1994	Accept

Appendix A ^{14}C ages constraining inferred great earthquakes at the Alaska subduction zone. *(Continued)*

Site #	Location	Original site code (if known)	Land-level change in 1964?	Site sequence #	Relation to quake (pre/post/unknown)	Lab # [or sample #]	^{14}C age	1-σ error	Material dated	Reference	**Accept / Reject** [Reason for rejection]
16	Turnagain Arm-Girdwood	BWS-4-4	Down	II	pre	[4]	730	100	peat	Bartsch-Winkler & Schmoll 1992	Accept
16	Turnagain Arm-Girdwood	91-1	Down	II	pre	Beta-45196	760	70	peat	Combellick & Reger 1994	Accept
16	Turnagain Arm-Girdwood	TA1-12.8	Down	II	pre	GX-15210	815	115	peat	Combellick 1991	Accept
16	Turnagain Arm-Girdwood	91-32-1	Down	II	pre	Beta-59792	830	60	rooted wood	Combellick & Reger 1994	Accept
16	Turnagain Arm-Girdwood	91-2-1	Down	II	pre	Beta-45197	860	60	rooted wood	Combellick & Reger 1994	Accept
16	Turnagain Arm-Girdwood	GW-2-G	Down	II	pre	Beta-184321	890	40	peat	Hamilton & Shennan 2005b	Accept
16	Turnagain Arm-Girdwood	91-4-1	Down	II	pre	Beta-45199	940	60	rooted wood	Combellick & Reger 1994	Accept
16	Turnagain Arm-Girdwood	GW-1-G	Down	II	pre	CAMS-93958	955	40	peat	Hamilton & Shennan 2005b	Accept
16	Turnagain Arm-Girdwood	91-20-5.6	Down	II	pre	Beta-47178	1010	60	peat	Combellick & Reger 1994	Accept
16	Turnagain Arm-Girdwood	92-31-2.5	Down		pre	Beta-50339	1040	60	peat	Combellick & Reger 1994	Reject [disturbed profile]
16	Turnagain Arm-Girdwood	92-19-1	Down	III	pre	Beta-54601	1380	60	peat	Combellick & Reger 1994	Accept
16	Turnagain Arm-Girdwood	GW-2-F	Down	III	pre	Beta-184326	1540	40	peat	Hamilton & Shennan 2005b	Accept
16	Turnagain Arm-Girdwood	BWS-4-5	Down	III?	pre	[5]	1565	45	wood	Bartsch-Winkler & Schmoll 1992	Accept
16	Turnagain Arm-Girdwood	TA1	Down		pre	GX-15211	1875	125	peat	Combellick 1991	Reject [age reversal]
16	Turnagain Arm-Girdwood	BWS-5-10	Down		pre	[10]	1910	100	wood	Bartsch-Winkler & Schmoll 1992	Accept
16	Turnagain Arm-Girdwood	92-19-2	Down	IV	pre	Beta-54602	2000	60	rooted wood	Combellick & Reger 1994	Accept
16	Turnagain Arm-Girdwood	TA1	Down	IV	pre	GX-15212	2100	75	peat	Combellick 1991	Accept
16	Turnagain Arm-Girdwood	91-3	Down	IV	pre	Beta-45198	2110	60	peat	Combellick & Reger 1994	Accept

Appendix A ^{14}C ages constraining inferred great earthquakes at the Alaska subduction zone. *(Continued)*

Site #	Location	Original site code (if known)	Land-level change in 1964?	Site sequence #	Relation to quake (pre/post/unknown)	Lab # [or sample #]	^{14}C age	1-σ error	Material dated	Reference	**Accept / Reject** [Reason for rejection]
16	Turnagain Arm-Girdwood	GW-2-E	Down	IV	pre	Beta-184324	2120	50	peat	Hamilton & Shennan 2005b	Accept
16	Turnagain Arm-Girdwood	BWS-5-17	Down	IV	pre	[17]	2140	35	peat	Bartsch-Winkler & Schmoll 1992	Reject [age reversal]
16	Turnagain Arm-Girdwood	BWS-5-12	Down	IV	pre	[12]	2290	60	peat	Bartsch-Winkler & Schmoll 1992	Accept
16	Turnagain Arm-Girdwood	BWS-5-14	Down	V	pre	[14]	2510	35	peat	Bartsch-Winkler & Schmoll 1992	Reject [age reversal]
16	Turnagain Arm-Girdwood	BWS-5-19	Down	V?	pre	[19]	2510	35	peat	Bartsch-Winkler & Schmoll 1992	Reject [age reversal]
16	Turnagain Arm-Girdwood	GW-2-C	Down	VI	pre	Beta-184330	2530	40	peat	Hamilton & Shennan 2005b	Accept
16	Turnagain Arm-Girdwood	GW-2-D	Down	V	pre	Beta-184327	2560	40	peat	Hamilton & Shennan 2005b	Accept
16	Turnagain Arm-Girdwood	92-19-3	Down	VI	pre	Beta-54603	2600	60	peat	Combellick & Reger 1994	Accept? [gradational upper contact]
16	Turnagain Arm-Girdwood	BWS-4-8	Down	VII?	pre	[8]	2660	90	wood	Bartsch-Winkler & Schmoll 1992	Accept
16	Turnagain Arm-Girdwood	GW-2-B	Down	VII?	pre	Beta-184328	2710	40	peat	Hamilton & Shennan 2005b	Accept
16	Turnagain Arm-Girdwood	TA1	Down	VII?	pre	GX-15213	2755	80	peat	Combellick 1991	Accept
16	Turnagain Arm-Girdwood	A-1	Down	VII?	pre	W-299	2800	180	rooted stump	Karlstrom 1964	Reject [low precision]
16	Turnagain Arm-Girdwood	GW-2-A	Down	VIII?	pre	Beta-184329	3040	40	peat	Hamilton & Shennan 2005b	Accept
16	Turnagain Arm-Girdwood	TA1	Down	IX?	pre	GX-15214	3455	145	peat	Combellick 1991	Accept
17	Turnagain Arm-Hope	BWS-12-28	Down	?	pre	[28]	2580	80	peat	Bartsch-Winkler & Schmoll 1992	Accept
18	Turnagain Arm-Ocean View	BWS-15-38	Down		pre	[38]	165	45	wood	Bartsch-Winkler & Schmoll 1992	Reject [1964 event?]
18	Turnagain Arm-Ocean View	BWS-15-39	Down		pre	[39]	200	40	peat	Bartsch-Winkler & Schmoll 1992	Reject [1964 event?]

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Appendix A ^{14}C ages constraining inferred great earthquakes at the Alaska subduction zone. *(Continued)*

Site #	Location	Original site code (if known)	Land-level change in 1964?	Site sequence #	Relation to quake (pre/post/unknown)	Lab # [or sample #]	^{14}C age	1-σ error	Material dated	Reference	**Accept / Reject** [Reason for rejection]
18	Turnagain Arm-Campbell Creek	BWS-16-46	Down		pre	[46]	635	40	wood	Bartsch-Winkler & Schmoll 1992	Reject [age reversal]
18	Turnagain Arm-Ocean View	BWS-15-41	Down		pre	[41]	680	70	wood	Bartsch-Winkler & Schmoll 1992	Reject [overlain by thin silt layer]
18	Turnagain Arm-Ocean View	BWS-15-42	Down		pre	[42]	890	60	peat	Bartsch-Winkler & Schmoll 1992	Accept
18	Turnagain Arm-Ocean View	OV-6-D	Down	II	pre	Beta-184317	940	50	macrofossils	Hamilton et al. 2005	Accept
18	Turnagain Arm-Ocean View	OV-6-D	Down	II	pre	Beta-184315	1070	40	macrofossils	Hamilton et al. 2005	Accept
18	Turnagain Arm-Ocean View	OV-6-D	Down	II	pre	AA-48163	1398	48	peat	Hamilton et al. 2005	Reject [sig. diff. from other ages at this contact]
18	Turnagain Arm-Ocean View	OV-23-C	Down	III	pre	Beta-184311	1500	40	macrofossils	Hamilton et al. 2005	Accept
18	Turnagain Arm-Ocean View	OV-2-C	Down	III	pre	Beta-184318	1530	40	macrofossils	Hamilton et al. 2005	Accept
18	Turnagain Arm-Ocean View	OV-23-B	Down	IV	pre	Beta-184312	2010	50	macrofossils	Hamilton et al. 2005	Accept
18	Turnagain Arm-Ocean View	OV-23-A	Down	V	pre	Beta-184322	2320	40	macrofossils	Hamilton et al. 2005	Accept
19	Turnagain Arm-Chickaloon Bay	92-17-3	Down	I	pre	Beta-54599	modern	—	Triglochin leaf bases	Combellick & Reger 1994	Reject [1964 event]
19	Turnagain Arm-Chickaloon Bay	92-14R-2	Down	I	pre	Beta-54793	modern	—	rooted wood (bark)	Combellick & Reger 1994	Reject [1964 event]
19	Turnagain Arm-Chickaloon Bay	92-17-1	Down	I	pre	Beta-54598	20	50	rooted wood (bark)	Combellick & Reger 1994	Reject [1964 event]
19	Turnagain Arm-Chickaloon Bay	92-14R-2	Down	I	pre	Beta-54592	260	50	peat	Combellick & Reger 1995	Reject [1964 event?]
19	Turnagain Arm-Chickaloon Bay	92-16-1	Down	I	pre	Beta-54596	300	70	rooted wood (bark)	Combellick & Reger 1994	Reject [1964 event?]

Appendix A ^{14}C ages constraining inferred great earthquakes at the Alaska subduction zone. *(Continued)*

Site #	Location	Original site code (if known)	Land-level change in 1964?	Site sequence #	Relation to quake (pre/post/ unknown)	Lab # [or sample #]	^{14}C age	1-σ error	Material dated	Reference	**Accept / Reject** [Reason for rejection]
19	Turnagain Arm-Chickaloon Bay	92-16-3	Down	II	pre	Beta-54597	910	60	peat	Combellick & Reger 1994	Accept
19	Turnagain Arm-Chickaloon Bay	92-14R-4	Down	II	pre	Beta-54593	930	60	woody peat	Combellick & Reger 1994	Accept
19	Turnagain Arm-Chickaloon Bay	BWS-13-31	Down	II	pre	[31]	940	60	peat	Bartsch-Winkler & Schmoll 1992	Accept (conforms with 92-16-3)
19	Turnagain Arm-Chickaloon Bay	92-17-4	Down	II	pre	Beta-54600	1010	70	peat	Combellick & Reger 1994	Accept
19	Turnagain Arm-Chickaloon Bay	BWS-13-29	Down		pre	[29]	1420	80	peat	Bartsch-Winkler & Schmoll 1992	Reject [detrital?]
19	Turnagain Arm-Chickaloon Bay	92-14R-7	Down		pre	Beta-54595	1940	70	peat	Combellick & Reger 1994	Reject [contact?]
19	Turnagain Arm-Chickaloon Bay	92-14R-6	Down	III	pre	Beta-54594	1960	50	peat	Combellick & Reger 1994	Accept
20	Knik Arm - Palmer Hay Flats	KA1B	Down	II	pre	GX-15225	470	70	wood-sedge-moss peat	Combellick 1991	Accept
20	Knik Arm - Palmer Hay Flats	KA7	Down	II	pre	GX-15465	495	120	wood-sedge peat	Combellick 1991	Accept
20	Knik Arm - Palmer Hay Flats	KA7	Down	II	pre	GX-15466	520	70	wood fragments	Combellick 1991	Accept
20	Knik Arm - Palmer Hay Flats	KA6	Down	II	pre	GX-15237	560	70	sedge peat	Combellick 1991	Accept
20	Knik Arm - Palmer Hay Flats	KA6	Down	III	pre	GX-15238	930	115	sedge peat	Combellick 1991	Accept
20	Knik Arm - Palmer Hay Flats	KA1	Down	III	pre	GX-15226	955	75	sedge peat	Combellick 1991	Accept
20	Copper R. delta-Alaganic Slough		Up	II	pre	W-6098	960	60	Carex	Plafker et al. 1992; p.c. 2000	Accept
20	Knik Arm - Palmer Hay Flats	KA6	Down	IV	pre	GX-15240	1800	125	woody peat	Combellick 1991	Reject [age reversal]
20	Knik Arm - Palmer Hay Flats	KA1	Down	IV	pre	GX-15227	2080	130	sedge peat	Combellick 1991	Accept

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Appendix A ^{14}C ages constraining inferred great earthquakes at the Alaska subduction zone. *(Continued)*

Site #	Location	Original site code (if known)	Land-level change in 1964?	Site sequence #	Relation to quake (pre/post/ unknown)	Lab # [or sample #]	^{14}C age	1-σ error	Material dated	Reference	**Accept / Reject** [Reason for rejection]
21	Knik Arm - Goose Bay	92-20-2	Down		pre	Beta-54605	180	50	rooted wood	Combellick & Reger 1994	Reject [1964 event?]
21	Knik Arm - Goose Bay	92-20-3	Down	II	pre	Beta-54606	480	60	peat	Combellick & Reger 1994	Accept
21	Knik Arm - Goose Bay	KA4B	Down	II	pre	GX-15233	510	70	sedge peat	Combellick 1991	Accept
21	Knik Arm - Goose Bay	KA4	Down	II	pre	GX-15231	515	75	wood-sedge peat	Combellick 1991	Accept
21	Knik Arm - Goose Bay	92-20-4	Down	III	pre	Beta-54607	990	60	peat	Combellick & Reger 1994	Accept
21	Knik Arm - Goose Bay	92-20R-1	Down	IV	pre	Beta-65790	1690	80	peat	Combellick & Reger 1994	Reject [3 thin peats]
22	Kenai R. flats	91-16-0.7	Down		pre	Beta-45208	180	60	rooted wood	Combellick & Reger 1994	Reject [1964 event?]
22	Kenai R. flats	90-2-3.7	Down		pre	GX-16471	1265	130	peat	Combellick & Reger 1994	Reject [sig. diff. from other age at this contact]
22	Kenai R. flats	91-16-2.0	Down	II?	pre	Beta-45209	1350	60	peat	Combellick & Reger 1994	Reject [sig. diff. from other age at this contact]
22	Kenai R. flats	KE1-4.9	Down	II	pre	Beta-49102	1590	80	peat	Combellick & Reger 1994	Accept?
22	Kenai R. flats	core 5: 131 cm	Down	II	pre	Beta-184332	1670	40	herbaceous stem	Hamilton & Shennan 2005a	Accept
22	Kenai R. flats	core 7: 165.5 cm	Down	II	pre	CAMS-93964	1670	45	herbaceous stem	Hamilton & Shennan 2005a	Accept
22	Kenai R. flats	91-16-2.3	Down		pre	Beta-50335	1840	60	rooted wood	Combellick & Reger 1994	Reject [no evidence of subsidence into intertidal zone]
22	Kenai R. flats	KE2-14.2	Down	III?	pre	Beta-49105	2530	80	silty peat	Combellick & Reger 1994	Accept? [gradational contact]
22	Kenai R. flats	91-18-3.7 (=90-2)	Down	IV?	pre	Beta-50337	2640	50	rooted wood	Combellick & Reger 1994	Accept

Appendix A ^{14}C ages constraining inferred great earthquakes at the Alaska subduction zone. *(Continued)*

Site #	Location	Original site code (if known)	Land-level change in 1964?	Site sequence #	Relation to quake (pre/post/unknown)	Lab # [or sample #]	^{14}C age	1-σ error	Material dated	Reference	**Accept / Reject** [Reason for rejection]
22	Kenai R. flats	KE2-15.9	Down	IV?	pre	Beta-49106	2780	90	peat	Combellick & Reger 1994	Accept
22	Kenai R. flats	KE2-16.4	Down	V?	pre	Beta-49107	2760	110	peat	Combellick & Reger 1994	Accept
22	Kenai R. flats	90-1-3.5	Down	V?	pre	GX-16470	2815	230	peat	Combellick & Reger 1994	Reject [low precision]
22	Kenai R. flats	91-30R-1	Down		pre	Beta-54591	3120	130	herbaceous roots	Combellick & Reger 1994	Reject [liquefaction feature - confused chronology]
22	Kenai R. flats	91-16-3.0	Down	?	pre	Beta-45210	3590	70	rooted wood	Combellick & Reger 1994	Reject [no evidence of subsidence into intertidal zone]
23	Kasilof R. flats	91-15-2.0	Down		pre	Beta-45200	120	60	peat	Combellick & Reger 1994	Reject [1964 event?]
23	Kasilof R. flats	KS1-2.9	Down		pre	Beta-49108	490	90	peat	Combellick & Reger 1994	Reject [possibly contaminated by modern roots]
23	Kasilof R. flats	KS1-3.65	Down		pre	Beta-49109	910	80	peat	Combellick & Reger 1994	Reject [gradational contact]
23	Kasilof R. flats	91-15-3.5	Down		pre	Beta-45201	1270	70	peat	Combellick & Reger 1994	Reject [very thin peat]
23	Kasilof R. flats	KS1-5.9	Down		pre	Beta-49110	1280	90	peaty mud	Combellick & Reger 1994	Reject [gradational contact]
23	Kasilof R. flats	91-15-3.9	Down	?	pre	Beta-45202	1560	50	peat	Combellick & Reger 1994	Accept
23	Kasilof R. flats	91-15-4.0	Down		pre	Beta-45203	1680	50	rooted wood	Combellick & Reger 1994	Reject [no evidence of subsidence into intertidal zone]
23	Kasilof R. flats	90-5-2.7	Down		pre	GX-16472	1810	80	peat	Combellick & Reger 1994	Reject [thick peat sample]

Appendix A ^{14}C ages constraining inferred great earthquakes at the Alaska subduction zone. *(Continued)*

Site #	Location	Original site code (if known)	Land-level change in 1964?	Site sequence #	Relation to quake (pre/post/unknown)	Lab # [or sample #]	^{14}C age	1-σ error	Material dated	Reference	**Accept / Reject** [Reason for rejection]
23	Kasilof R. flats	91-15-4.8	Down		pre	Beta-45204	3470	70	rooted wood	Combellick & Reger 1994	Reject [no evidence of subsidence into intertidal zone]
24	Fox R. flats	FR5-1.6	Down		pre	Beta-49100	10	100	silty peat	Combellick & Reger 1994	Reject [1964 event]
24	Fox R. flats	91-10-1	Down		u	Beta-50330	190	60	detrital wood	Combellick & Reger 1994	Reject [flood deposit?]
24	Fox R. flats	FR4-1.5	Down	II?	pre	Beta-49099	600	100	plant fragments, twig and silty peat	Combellick & Reger 1994	Accept
24	Fox R. flats	91-14-1	Down		u	Beta-50330	800	70	detrital wood	Combellick & Reger 1994	Reject [flood or tsunami deposit?]
24	Fox R. flats	91-11-1	Down		pre	Beta-50329	1020	90	Triglochin leaf bases	Combellick & Reger 1994	Reject [weak evidence of subsidence into intertidal zone]
24	Fox R. flats	FR3-2.4	Down	III?	pre	Beta-49098	1200	110	peaty silt	Combellick & Reger 1994	Reject [v. thin peat]
25	Shuyak Is. - Skiff Passage Marsh	SI-A-4	Down	II	post	QL-4741	260	20	Triglochin peat	Gilpin 1995	Accept
25	Shuyak Is. - Koniag Marsh	SI-A-2	Down	II	post	QL-4589	310	30	Triglochin peat	Gilpin 1995	Accept
25	Shuyak Is. - Skiff Passage Marsh	SI-A-4	Down		pre	QL-4742	330	25	sphagnum peat	Gilpin 1995	Reject [sig. diff. from other ages at this contact]
25	Shuyak Is. - Koniag Marsh	SI-A-2	Down	II	pre	QL-4590	330	30	sphagnum peat	Gilpin 1995	Accept
25	Shuyak Is. - Skiff Passage Marsh	SI-A-4	Down	III	pre	QL-4592	443	14	sphagnum peat	Gilpin 1995	Accept
25	Shuyak Is. - Deer Marsh	SI-A-5	Down	II	post	QL-4596	447	30	Triglochin? peat	Gilpin 1995	Accept

Appendix A ^{14}C ages constraining inferred great earthquakes at the Alaska subduction zone. *(Continued)*

Site #	Location	Original site code (if known)	Land-level change in 1964?	Site sequence #	Relation to quake (pre/post/ unknown)	Lab # [or sample #]	^{14}C age	1-σ error	Material dated	Reference	**Accept / Reject** [Reason for rejection]
25	Shuyak Is. - Bear Trail Marsh	SI-A-7	Down	II	pre	QL-4750	490	20	peat	Gilpin 1995	Reject [weak strat. correlation]
25	Shuyak Is. - Deer Marsh	SI-A-5	Down	II	pre	QL-4597	494	23	Triglochin? peat	Gilpin 1995	Accept
25	Shuyak Is. - Skiff Passage Marsh	SI-A-4	Down		post	QL-4591	790	20	Triglochin peat	Gilpin 1995	Reject [age reversal]
25	Shuyak Is. - Skiff Passage Marsh	SI-A-4	Down	III	post	QL-4593	1248	21	Triglochin peat	Gilpin 1995	Accept
25	Shuyak Is. - Skiff Passage Marsh	SI-A-4	Down	III	pre	QL-4594	1516	17	sphagnum peat	Gilpin 1995	Accept
25	Shuyak Is. - Bear Trail Marsh	SI-A-8	Down	IV/V?	pre	QL-4600	2776	16	peat	Gilpin 1995	Reject [weak strat. correlation]
26	Afognak Is. - Back Bay Marsh	AI-A-1	Down	II	post	Beta-48804	380	60	Triglochin peat	Gilpin 1995	Accept
26	Afognak Is. - Back Bay Marsh	AI-A-1	Down	II	pre	QL-4667	483	26	sphagnum peat	Gilpin 1995	Accept
27	Kodiak Is. - Anton Larsen Bay	KI-AL-A-1	Down	III	post	QL-4583	1300	25	Triglochin peat	Gilpin 1995	Accept
27	Kodiak Is. - Anton Larsen Bay	KI-AL-A-1	Down	III	pre	UA	1430	45	sphagnum peat	Gilpin 1995	Accept
27	Kodiak Is. - Anton Larsen Bay	KI-AL-A-1	Down		pre	QL-4584	1630	20	sphagnum peat	Gilpin 1995	Reject [sig. diff. from other ages at this contact]
28	Kodiak Is. - Kalsin Bay	KI-KL-3B	Down			Beta-48801	90	60	wood	Gilpin 1995	Reject [no stratigraphic information]
28	Kodiak Is. - Kalsin Bay	KI-KL-3A	Down			QL-4586	500	20	sphagnum	Gilpin 1995	Reject [no strat. information]
28	Kodiak Is. - Middle Bay	KI-SC-1	Down		pre	QL-4587	710	30	Triglochin peat	Gilpin 1995	Reject [uncertain origin]
28	Kodiak Is. - Middle Bay	KI-SC-1	Down		post	QL-4588	800	30	Triglochin peat	Gilpin 1995	Reject [sig. diff. from other ages at this contact]

Appendix A ^{14}C ages constraining inferred great earthquakes at the Alaska subduction zone. *(Continued)*

Site #	Location	Original site code (if known)	Land-level change in 1964?	Site sequence #	Relation to quake (pre/post/unknown)	Lab # [or sample #]	^{14}C age	1-σ error	Material dated	Reference	**Accept / Reject** [Reason for rejection]
28	Kodiak Is. - Kalsin Bay	KI-KL-1A	Down	III?	pre	Beta-48800	1020	60	sphagnum	Gilpin 1995	Accept
28	Kodiak Is. - Middle Bay	KI-SC-1	Down	III?	pre	Beta-48809A	1060	60	sphagnum peat	Gilpin 1995	Accept
28	Kodiak Is. - Kalsin Bay	KI-KL-1A	Down	III?	pre	QL-4585	1070	30	sphagnum	Gilpin 1995	Accept
28	Kodiak Is. - Middle Bay	KI-SC-1	Down	III?	post	Beta-48809B	1070	70	Triglochin peat	Gilpin 1995	Accept
29	Sitkalidak Is. - Tanginak Lagoon	SDI-92-4-45	Up?	II	pre	QL-4672	353	23	sphagnum peat	Gilpin 1995	Reject [stratigraphy very variable]
29	Sitkalidak Is. - Seal Bay	SDI-92-2-1	Up?	II	post	QL-4745	610	70	non-Triglochin peat	Gilpin 1995	Reject [little deformation in 1964]
29	Sitkalidak Is. - Seal Bay	SDI-92-2-1	Up?	II	pre	QL-4671	625	30	Triglochin peat	Gilpin 1995	Reject [little deformation in 1964]
29	Sitkalidak Is. - Rolling Bay	SDI-92-RB	Down?	?	?	QL-4746	770	25	peat	Gilpin 1995	Reject [dates marsh initiation]
29	Sitkalidak Is. - Three Sisters	SDI-92-TS	Down?	?	post	QL-4747	1600	25	Triglochin peat	Gilpin 1995	Reject [little deformation in 1964]
29	Sitkalidak Is. - Tanginak Lagoon	SDI-92-5	Up?	?	pre	QL-4673	1675	25	Triglochin peat	Gilpin 1995	Reject [stratigraphy very variable]
29	Sitkalidak Is. - Tanginak Lagoon	SDI-92-4-1	Up?	IV?	pre	QL-4748	2530	25	organic silt	Gilpin 1995	Reject [stratigraphy very variable]
30	Kodiak Is. - Sturgeon Lagoon	KI-KK-A-2	Down	II	pre	QL-4669	330	30	sphagnum peat	Gilpin 1995	Accept
30	Kodiak Is. - Sturgeon Lagoon	KI-KK-A-2	Down	II	post	Beta-48802	580	60	Triglochin peat	Gilpin 1995	Reject [out of sequence]
30	Kodiak Is. - Sturgeon Lagoon	KI-KK-A-2	Down	III	pre	QL-4670	1215	30	Triglochin peat	Gilpin 1995	Accept

Appendix B Late Holocene ^{14}C ages from prehistoric coastal archaeological sites at the Alaska subduction zone.

AHRS nr (49-)	Site name	Lab nr	^{14}C age	1-σ error	Material dated[a]	Context	Reference
Prince William Sound segment							
"Outer coast"							
COR 001	Palugvik	P-192	1727	105	WD	house post? (inner wood)	Clark 1984
COR 001	Palugvik	P-173	2265	112	WD	shovel (paraffin treated)	Clark 1984
COR 038	Hawkins Is. ("Tauxtvik") ("C")	Beta-23369	570	120	?		Dotter 1988
COR 038	Hawkins Is. ("Tauxtvik") ("C")	Beta-23370	610	70	?		Dotter 1988
COR 080	Hawkins Island	WSU-2240	385	100	?		Dotter 1988
COR 081	Little Nuchek	WSU-2239	460	90	?	intertidal test pit	Dotter 1988
COR 318?	Orca Inlet ("B")	Beta-23380	350	60	?		Dotter 1988
SEW 068	Kake Cove, Chenega I.	GX-17343	1665	65	WD	wooden artifacts in peat just below present sandy cobble beach	Reger et al. 1992
SEW 068	Kake Cove, Chenega I.	GX-17342	1985	65	WD	wooden artifacts just below present sandy cobble beach	Reger et al. 1992
SEW 080/081/082	Montague Island ("L")	Beta-23372	190	70	CH		Dotter 1988
SEW 080/081/082	Montague Island ("L")	Beta-23378	310	50	CH		Dotter 1988
SEW 080/081/082	Montague Island ("L")	Beta-23371	340	80	CH		Dotter 1988
SEW 080/081/082	Montague Island ("L")	Beta-23373	550	80	CH		Dotter 1988
SEW 234		WSU-2913	95	65	CH		Dotter 1988
SEW 234		WSU-2911	315	65	CH		Dotter 1988
SEW 234		WSU-2910	695	40	CH		Dotter 1988
SEW 430		Beta-42077	660	80	CH	rockshelter	Haggarty et al. 1991
SEW 440	Eleanor I.	Beta-78756	280	60	CH	cultural; coincides stratigraphically with patchy tephra in northern part of site (= Valdez ash?)	Yarborough 1997
SEW 440	Eleanor I.	Beta-78760	380	60	CH	cultural	Yarborough 1997
SEW 440	Eleanor I.	Beta-78759	400	50	CH	cultural	Yarborough 1997
SEW 440	Eleanor I.	Beta-97208	530	60	CH	cultural; overlies bedrock and predates heavy FCR deposition at eastern edge of site	Yarborough 1997
SEW 440	Eleanor I.	Beta-97209	1030	100	CH	cultural	Yarborough 1997

Appendix B Late Holocene ^{14}C ages from prehistoric coastal archaeological sites at the Alaska subduction zone. *(Continued)*

AHRS nr (49-)	Site name	Lab nr	^{14}C age	1-σ error	Material dated[a]	Context	Reference
SEW 440	Eleanor I.	Beta-78758	1820	60	CH	cultural, in gravel layer at 64 cm? (N16-E27); also dates underlying tephra (White River north lobe = 1885 BP)	Yarborough 1997
SEW 488	Knight I.	Beta-89039	250	50	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-78764	300	50	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-78761	350	50	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89040	360	60	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-78768	380	50	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89043	430	50	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89044	430	50	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-78767	460	60	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89046	520	50	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89045	560	60	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89047	560	70	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89055	570	70	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89052	590	60	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-78763	600	60	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89038	600	60	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-78762	610	60	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89054	620	80	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89051	700	60	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-78766	810	50	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89048	820	60	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-78765	900	70	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89049	910	90	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89050	990	60	CH	cultural	Yarborough 1997

Appendix B Late Holocene ^{14}C ages from prehistoric coastal archaeological sites at the Alaska subduction zone. *(Continued)*

AHRS nr (49-)	Site name	Lab nr	^{14}C age	1-σ error	Material dated[a]	Context	Reference
SEW 488	Knight I.	Beta-89056	1130	80	CH	cultural; dates pumice (varies from 90–140 cm depth)	Yarborough 1997
SEW 488	Knight I.	Beta-89057	1290	50	CH	cultural	Yarborough 1997
SEW 488	Knight I.	Beta-89042	1680	50	CH	from peat; occupation of site uncertain	Yarborough 1997
SEW 488	Knight I.	Beta-89058	2680	60	CH	occupational extent unknown	Yarborough 1997
SEW 548	Icy Bay islet ("I")	Beta-23376	440	80	CH		Dotter 1988
SEW 548	Icy Bay islet ("I")	Beta-97210	990	80	CH	non-cultural layer? (70–90 cm in N25E33)	Yarborough 1997
"Inner coast"							
ANC 589	College Fjord ("A")	Beta-18573	460	70	?	hearth in intertidal test pit; charcoal interlayered with fine sand	Dotter 1988
SEW 056	Uqciuvit	WSU-3938	110	90	W	cultural; questionable age	Yarborough & Yarborough 1991
SEW 056	Uqciuvit	WSU-3914	200	90	?	burial from final stage of occupation	Yarborough & Yarborough 1991
SEW 056	Uqciuvit	WSU-3913	295	90	W	house "floor"?	Yarborough & Yarborough 1991
SEW 056	Uqciuvit	Beta-30558	590	60	?	house pit	Yarborough & Yarborough 1991
SEW 056	Uqciuvit	WSU-3940	830	65	?	house "floor"?	Yarborough & Yarborough 1991
SEW 056	Uqciuvit	WSU-3915	960	60	CH?	cultural	Yarborough & Yarborough 1991
SEW 056	Uqciuvit	WSU-3911	1020	60	CH?	cultural	Yarborough & Yarborough 1991
SEW 056	Uqciuvit	WSU-3937	1400	70	CH?	cultural from upper EPA strat. level in higher part of site	Yarborough & Yarborough 1991
SEW 056	Uqciuvit	WSU-3941	1510	120	CH?	cultural; above gravel	Yarborough & Yarborough 1991
SEW 056	Uqciuvit	Beta-28804	2000	110	CH?	cultural; below gravel	Yarborough & Yarborough 1991
SEW 056	Uqciuvit	WSU-3939	2310	60	CH?	cultural; below gravel	Yarborough & Yarborough 1991

Appendix B Late Holocene ^{14}C ages from prehistoric coastal archaeological sites at the Alaska subduction zone. *(Continued)*

AHRS nr (49-)	Site name	Lab nr	^{14}C age	1-σ error	Material dated[a]	Context	Reference
SEW 056	Uqciuvit	WSU-3916	2370	70	CH?	cultural; below gravel	Yarborough & Yarborough 1991
SEW 056	Uqciuvit	WSU-3936	3380	100	CH?	in oldest stratum just above grey silt loam	Yarborough & Yarborough 1991
SEW 056	Uqciuvit	WSU-3912	3810	90	CH?	in oldest stratum at base of pit; few artifacts	Yarborough & Yarborough 1991
SEW 349/ 553/554/ 555	Unakwik Inlet ("F")	Beta-23381	530	80	CH		Dotter 1988
SEW 349/ 553/554/ 555	Unakwik Inlet ("F")	Beta-23366	1090	70	CH		Dotter 1988
Kenai segment							
"Outer coast"							
SEL 188	MacArthur Pass	Beta-39475	620	50	CH		Schaaf & Johnson 1990; Betts et al. 1991; Erlandson et al. 1992
SEL 188	MacArthur Pass	Beta-39476	560	50	CH		Schaaf & Johnson 1990; Betts et al. 1991
SEL 188	MacArthur Pass	Beta-39477	710	50	CH		Schaaf & Johnson 1990; Betts et al. 1991
SEL 188	MacArthur Pass	Beta-39478	700	90	CH		Schaaf & Johnson 1990; Betts et al. 1991
SEL 188	MacArthur Pass	GX-17226	825	65	CH	split w/ GX-17227	Dekin et al. 1993; Crowell & Mann 1996
SEL 188	MacArthur Pass	GX-17227	660	60	CH	split w/ GX-17226	Dekin et al. 1993; Crowell & Mann 1996
		wt. mean & sd	*736*	*88*			
SEL 188	MacArthur Pass	GX-17232	855	115	CH	split w/ GX-17233	Dekin et al. 1993; Crowell & Mann 1996
SEL 188	MacArthur Pass	GX-17234	1005	65	WD	split w/ GX-17235	Dekin et al. 1993; Crowell & Mann 1996
SEL 188	MacArthur Pass	GX-17235	1210	65	WD	split w/ GX-17234	Dekin et al. 1993; Crowell & Mann 1996
		wt. mean & sd	*1108*	*44*			
SEL 188	MacArthur Pass	GX-17236	585	105	CH	split w/ GX-17237	Dekin et al. 1993; Crowell & Mann 1996
SEL 188	MacArthur Pass	GX-17237	670	105	CH	split w/ GX-17236	Dekin et al. 1993; Crowell & Mann 1996
		wt. mean & sd	*628*	*74*			

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Appendix B Late Holocene ^{14}C ages from prehistoric coastal archaeological sites at the Alaska subduction zone. *(Continued)*

AHRS nr (49-)	Site name	Lab nr	^{14}C age	1-σ error	Material dated[a]	Context	Reference
SEL 188	MacArthur Pass	GX-17238	770	65	CH	split w/ GX-17239	Dekin et al. 1993; Crowell & Mann 1996
SEL 188	MacArthur Pass	GX-17239	925	105	CH	split w/ GX-17238	Dekin et al. 1993; Crowell & Mann 1996
		wt. mean & sd	*813*	*55*			
SEL 188	MacArthur Pass	Beta-39479	1350	70	CH		Schaaf & Johnson 1990; Betts et al. 1991
SEL 188	MacArthur Pass	GX-17228	1690	140	CH	split w/ GX-17229	Dekin et al. 1993; Crowell & Mann 1996
SEL 188	MacArthur Pass	GX-17229	1710	120	CH	split w/ GX-17228	Dekin et al. 1993; Crowell & Mann 1996
		wt. mean & sd	*1700*	*90*			
SEL 215	Berger Bay, Nuka I.	GX-17335	670	60	CH	from artifact-bearing upper peat	Reger et al. 1992
SEL 215	Berger Bay, Nuka I.	GX-17336	665	105	CH	from artifact-bearing upper peat	Reger et al. 1992
SEL 215	Berger Bay, Nuka I.	GX-17337	840	60	CH	from artifact-bearing upper peat	Reger et al. 1992
SEL 215	Berger Bay, Nuka I.	GX-17338	655	100	WD	from artifact-bearing upper peat	Reger et al. 1992
SEL 215	Berger Bay, Nuka I.	GX-17339	920	60	WD	from artifact-bearing upper peat	Reger et al. 1992
SEL 215	Berger Bay, Nuka I.	GX-17340	425	105	WD	from artifact-bearing upper peat	Reger et al. 1992
SEL 215	Berger Bay, Nuka I.	GX-17341	635	60	WD	from artifact-bearing upper peat	Reger et al. 1992
XBS 020	Northwest Lagoon	Beta-23383	140	60	CH		Dotter 1988; Kent & McCallum 1991
XBS 020	Northwest Lagoon	Beta-67272	240	70	CH		Crowell & Mann 1996
XBS 020	Northwest Lagoon	Beta-23382	320	50	CH		Dotter 1988; Kent & McCallum 1991
XBS 020	Northwest Lagoon	Beta-67267	580	80	CH		Crowell & Mann 1996
XBS 020	Northwest Lagoon	Beta-67271	610	90	CH		Crowell & Mann 1996
XBS 020	Northwest Lagoon	Beta-67269	660	90	CH		Crowell & Mann 1996
XBS 020	Northwest Lagoon	Beta-67270	690	90	CH		Crowell & Mann 1996
XBS 020	Northwest Lagoon	Beta-67268	830	70	CH		Crowell & Mann 1996

Appendix B Late Holocene ^{14}C ages from prehistoric coastal archaeological sites at the Alaska subduction zone. *(Continued)*

AHRS nr (49-)	Site name	Lab nr	^{14}C age	1-σ error	Material dated[a]	Context	Reference
XBS 030	Bear Cove Village	Beta-222209	130	40	CH	Phase 3 (house floor in structure 19)	A Crowell (unpublished data)
XBS 030	Bear Cove Village	Beta-222210	260	50	CH	Phase 3 (house floor in structure 20)	A Crowell (unpublished data)
XBS 030	Bear Cove Village	Beta-67273	590	50	CH	Phase 2 (upper house floor in structure 7; stratum 3)	Crowell & Mann 1996
XBS 030	Bear Cove Village	Beta-67274	640	110	CH	Phase 2 (upper house floor in structure 7; stratum 3)	Crowell & Mann 1996
XBS 030	Bear Cove Village	Beta-170800	710	60	CM	Phase 1 (lower house floor; bottom of stratum 5 in structure 7)	Crowell 2003
XBS 030	Bear Cove Village	Beta-170803	720	70	CM	Phase 1 (bottom of feature B, stratum 3 in structure 8)	Crowell 2003
XBS 030	Bear Cove Village	Beta-170797	860	70	CM	Phase 1 (lower house floor; top of stratum 5 in structure 7)	Crowell 2003
XBS 030	Bear Cove Village	Beta-170804	960	80	CM	charcoal lens 10 cm below structure 8 house floor	Crowell 2003
XBS 030	Bear Cove Village	Beta-170805	1010	110	CM	charcoal lens 60 cm below structure 8 house floor	Crowell 2003
XBS 031	Verdant Cove South Midden	Beta-67277	570	50	CH		Crowell & Mann 1996
"Inner coast"							
SEL 010	Halibut Cove 1 (Pt. West)	WSU-3812	510	60	CH	house (hearth) - above midden	Mills 1994; Reger & Boraas 1996
SEL 010	Halibut Cove 1 (Pt. West)	WSU-3810	775	60	CH	house (hearth) - above midden	Mills 1994; Reger & Boraas 1996
SEL 010	Halibut Cove 1 (Pt. West)	WSU-3859	1100	60	CW	near top of midden	Mills 1994; Reger & Boraas 1996
SEL 010	Halibut Cove 1 (Pt. West)	WSU-3811	1940	70	CH	base of midden	Mills 1994; Reger & Boraas 1996
SEL 027	Port Graham	Beta-99311	500	60	CH	postdates site occupation	Workman & Workman 1997
SEL 027	Port Graham	Beta-99312	570	80	CH	cultural deposits	Workman & Workman 1997
SEL 027	Port Graham	Beta-99310	610	60	CH	cultural deposits	Workman & Workman 1997

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Appendix B Late Holocene ^{14}C ages from prehistoric coastal archaeological sites at the Alaska subduction zone. *(Continued)*

AHRS nr (49-)	Site name	Lab nr	^{14}C age	1-σ error	Material dated[a]	Context	Reference
SEL 030	Cottonwood Creek	S-1054	1555	75	CH	midden	Mills 1994
SEL 030	Cottonwood Creek	S-1042	1745	65	CW	floor plank	Mills 1994
SEL 030	Cottonwood Creek	S-1043	1750	125	CW	floor plank	Mills 1994
SEL 033	Chugachik Island	UGa-2344	1475	70	CH	midden	Mills 1994
SEL 033	Chugachik Island	S-1063	1705	65	CH	midden	Mills 1994; Reger & Boraas 1996
SEL 033	Chugachik Island	UGa-2342	1940	90	CH	midden	Mills 1994
SEL 033	Chugachik Island	S-1062	2310	65	BB	midden	Mills 1994
SEL 033	Chugachik Island	UGa-2343	2740	75	WD	midden	Mills 1994
SEL 041	Fox Farm and Bluff	UGa-2339	1090	195	CH	midden	Mills 1994 (reject; too imprecise)
SEL 041	Fox Farm and Bluff	UGa-2340	1130	120	CH	occupation layer	Mills 1994
SEL 041	Fox Farm and Bluff	UGa-2341	1315	250	CH	midden	Mills 1994 (reject; too imprecise)
SEL 079	Seal Beach	UGa-3635	1685	100	CH	midden	Mills 1994
SEL 079	Seal Beach	UGa-3636	2050	60	CH	lower component	Mills 1994
SEL 245	Sylva	Beta-58167	1020	60	CH	unknown cultural affinity	Mills 1994
KEN 045	Clam Gulch	I-12161	190	80	CH		Reger 1987
KEN 045	Clam Gulch	I-12166	240	70	CH		Reger 1987
KEN 045	Clam Gulch	I-12167	200	70	CH		Reger 1987
KEN 045	Clam Gulch	Beta-6686	340	50	CH		Reger 1987
KEN 045	Clam Gulch	I-12168	360	80	CH		Reger 1987
KEN 230	?	WSU-4142	350	90			Reger & Boraas 1996
KEN 230	?	WSU-4143	220	120			Reger & Boraas 1996
KEN 230	?	WSU-4144	310	90			Reger & Boraas 1996
KEN 232	Nelson	WSU-4148	380	90			Reger & Boraas 1996
KEN 233	Pelch	WSU-4147	540	90			Reger & Boraas 1996
KEN 233	Pelch	WSU-4149	645	60			Reger & Boraas 1996
Kodiak-Katmai segment							
"Outer coast"							
AFG 004	Aleut Town	Beta-150811	1090	80	CM	hearth at south end of excavation	D Clark, p.c. to Fitzhugh 2003
AFG 005	Malina Creek	?	500	50	?		Knecht 1995

Appendix B Late Holocene ^{14}C ages from prehistoric coastal archaeological sites at the Alaska subduction zone. *(Continued)*

AHRS nr (49-)	Site name	Lab nr	^{14}C age	1-σ error	Material dated[a]	Context	Reference
AFG 005	Malina Creek	Beta-42073	620	70	?		Haggarty et al. 1991; Mills 1994
AFG 010	Salmon Bend	Beta-170061	1330	60	CM	Top of fill in main room, immediately before tsunami	D Clark, p.c. to Fitzhugh 2003
AFG 010	Salmon Bend	Beta-170060	1400	80	CM	Annex room, well above floor, but well below top	D Clark, p.c. to Fitzhugh 2003
AFG 011		GaK-3803	3890	110	?		Clark 1997; Mills 1994
AFG 012		Beta-101917	280	60	CM	Sq. 4 Midden	Partlow 2000
AFG 012		Beta-101914	310	40	CM	Sq. 2 House hearth	Partlow 2000
AFG 012		Beta-101915	420	60	CM	Sq. 1	Partlow 2000
AFG 012		Beta-101916	450	60	CM	Sq. 2. Sub house floor pit	Partlow 2000
AFG 015	Settlement Point	Beta-101552	300	50	CH	House 2 hearth	Saltonstall & Carver 2002
AFG 015	Settlement Point	Beta-114205	300	50	CH	House 6 hearth	Saltonstall & Carver 2002
AFG 015	Settlement Point	Beta-114203	330	60	CH	House 4 hearth	Saltonstall & Carver 2002
AFG 015	Settlement Point	Beta-114098	340	60	CH	Midden L2G	Saltonstall & Carver 2002
AFG 015	Settlement Point	Beta-114097	350	70	CH	House 3 hearth	Saltonstall & Carver 2002
AFG 015	Settlement Point	Beta-114096	370	80	CH	Midden L1	Saltonstall & Carver 2002
AFG 015	Settlement Point	Beta-101913	390	50	CH	Midden L2D/ L2E contact	Saltonstall & Carver 2002
AFG 015	Settlement Point	Beta-101912	440	50	CH	Midden bottom L2	Saltonstall & Carver 2002
AFG 015	Settlement Point	Beta-114202	440	60	CH	House 5 hearth	Saltonstall & Carver 2002
AFG 015	Settlement Point	Beta-114204	450	50	CH	House 7 hearth	Saltonstall & Carver 2002
AFG 015	Settlement Point	Beta-118300	570	60	CH	House 1 floor	Saltonstall & Carver 2002
AFG 015	Settlement Point	Beta-101551	620	50	CH	House 1 hearth	Saltonstall & Carver 2002
AFG 088	Afognak River	Beta-88720	2780	110	CH	intrusive feature, base of site	Clark 1997
AFG 088	Afognak River	Beta-88719	3490	90	CH	base of site	Clark 1997
AFG 088	Afognak River	Beta-77807	3530	80	CH	base of site	Clark 1997
AFG 215	Tsunami	Beta-165141	880	40	CM	above tsunami deposit in cultural material	D Clark, p.c. to Fitzhugh 2003
AFG 215	Tsunami	Beta-165139	1320	80	CM	termination of main house just below tsunami deposit	D Clark, p.c. to Fitzhugh 2003

Appendix B Late Holocene ^{14}C ages from prehistoric coastal archaeological sites at the Alaska subduction zone. *(Continued)*

AHRS nr (49-)	Site name	Lab nr	^{14}C age	1-σ error	Material dated[a]	Context	Reference
AFG 215	Tsunami	Beta-165140	1750	60	CM	from orange clay floor of house, should just postdate beginning of occupation	D Clark, p.c. to Fitzhugh 2003
KOD 026	Monashka Bay	P-1049	298	44	CH	riverine site	Clark 1966a,b; Mills 1994
KOD 026	Monashka Bay	Beta-33545	1570	60	CH lens	from fire pit	C Donta, p.c. 1992 to Mills 1994
KOD 026	Monashka Bay	Beta-34832	1680	50	CH lens	midden sample	C Donta, p.c. 1992 to Mills 1994
KOD 043	Kizhuyak	B-836	600	100	CH		Clark 1984; Mills 1994
KOD 044	Crag Pt.	Beta-20122	910	60	CH		Haggarty et al. 1991; Mills 1994
KOD 044	Crag Pt.	Beta-45944	910	70	CH		Mills 1994
KOD 044	Crag Pt.	Beta-20533	1890	90	CH		Haggarty et al. 1991; Mills 1994
KOD 044	Crag Pt.	Beta-92094	1940	60	WD		D Clark, p.c. to Fitzhugh 2003
KOD 044	Crag Pt.	Beta-48044	2000	70	CH		Mills 1994
KOD 044	Crag Pt.	P-1057	2033	52	CH	approx. basal date from main component	D Clark, p.c. to Fitzhugh 2003
KOD 044	Crag Pt.	Beta-48043	2190	90	?		Mills 1994
KOD 044	Crag Pt.	Beta-45943	2380	70	CH		Mills 1994
KOD 044	Crag Pt.	Beta-94894	3150	80	BO	dark thick lower stony black Kachemak layer	D Clark, p.c. to Fitzhugh 2003
KOD 044	Crag Pt.	Beta-45942	3160	70	CH		Mills 1994
KOD 044	Crag Pt.	Beta-66656	3190	50	CH		Mills 1994
KOD 044	Crag Pt.	Beta-66655	3290	50	CH		Mills 1994
KOD 044	Crag Pt.	Beta-45945	3340	60	CH		Mills 1994
KOD 083	Three Saints	P-1042	2028	55	CH	associated with hearth and clay-lined basin	Clark 1966a; Mills 1994
KOD 099	Kiavak (Naumliak, Nayumlyak, Kiyaik)	P-1044	280	44	CH	basal level in rubble lens	Clark 1966a; Mills 1994
KOD 099	Kiavak (Naumliak, Nayumlyak, Kiyaik)	P-1045	391	48	CH	refuse lens	Clark 1966a; Mills 1994
KOD 100	Kiavak	S-2996	1960	75	CH	housepit, penetrates to near base	Clark 1997
KOD 100	Kiavak	S-3488	2750	130	CH	bulk sample collected from over 40 vertical cm; may mix charcoal, shell, bone, and oil	Clark 1997
KOD 100	Kiavak	P-1039	3263	71	CH	midden, middle component	Clark 1974

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Appendix B Late Holocene ^{14}C ages from prehistoric coastal archaeological sites at the Alaska subduction zone. *(Continued)*

AHRS nr (49-)	Site name	Lab nr	^{14}C age	1-σ error	Material dated[a]	Context	Reference
KOD 101	Rolling Bay	P-1048	353	44	CH	exterior hearth; base of deposit	Clark 1966b; Mills 1994
KOD 101	Rolling Bay	P-1047	393	40	CH	exterior hearth; base of deposit	Clark 1966b; Mills 1994
KOD 106	SAS 126	Beta-78518	930	70	CH		Fitzhugh 2003
KOD 110	SAS 25	Beta-78502	480	60	CH		Fitzhugh 2003
KOD 210	Blisky	Beta-77806	340	70	WD/CH	fire pit, burned log, may be part of sweat bath feature; should be older than sweat bath due to old-wood problem	D Clark, p.c. to Fitzhugh 2003
KOD 210	Blisky	Beta-77805	410	80	GR	in sweat bath feature; should be accurate age of bath	D Clark, p.c. to Fitzhugh 2003
KOD 210	Blisky	Beta-77804	2010	80		hearth, base of site, test pit	D Clark, p.c. to Fitzhugh 2003
KOD 210	Blisky	Beta-113164	2880	120	CH	from discrete lens in house floor	Steffian, p.c. to Fitzhugh 2003
KOD 210	Blisky	Beta-113163	3050	60	CH	from FCR dump	Steffian, p.c. to Fitzhugh 2003
KOD 324	Kizhuyak Bay	Beta-14497	2700	90	CH	charcoal lens in midden	Crozier 1989; Mills 1994
KOD 324	Kizhuyak Bay	Beta-8186	3520	60	CH	from erosion profile	Mills 1994
KOD 324	Kizhuyak Bay	Beta-14500	3630	80	CH	from test pit—no other info	Mills 1994
KOD 504	SAS 48	Beta-78503	360	60	CH		Fitzhugh 2003
KOD 509	SAS 54	Beta-78505	820	90	CH		Fitzhugh 2003
KOD 510	SAS 55	Beta-78521	400	50	CH		Fitzhugh 2003
KOD 516	SAS 62	Beta-78506	1720	60	CH		Fitzhugh 2003
KOD 540	SAS 100	Beta-78511	1500	60	CH		Fitzhugh 2003
KOD 541	SAS 101	Beta-78512	1530	60	CH		Fitzhugh 2003
KOD 552	SAS 117	Beta-78514	1090	60	CH		Fitzhugh 2003
KOD 564	SAS 49	Beta-71092	1750	60	CH		Fitzhugh 2003
KOD 564	SAS 49	Beta-91316	1890	70	CH		Fitzhugh 2003
KOD 566	SAS 86	Beta-78510	1610	60	CH		Fitzhugh 2003
KOD 578	SAS 143	Beta-91318	2110	50	CH		Fitzhugh 2003
XTI 052	Sitkinak	Beta-7325	200	50	?	?	Haggarty et al. 1991; Mills 1994
XTI 052	Sitkinak	Beta-7326	750	80	?	?	Haggarty et al. 1991; Mills 1994
"Inner coast"							
AFG 082	Shuyak I.	GX-17333	1730	65	CH	lower midden	Reger et al. 1992
AFG 082	Shuyak I.	GX-17334	1840	65	CH	lower midden	Reger et al. 1992
AFG 098	Neketa Bay, Shuyak I.	GX-17332	360	125	spruce bark	upper component	Reger et al. 1992
AFG 098	Neketa Bay, Shuyak I.	GX-17323	500	60	bark (spruce?)	upper component	Reger et al. 1992
AFG 098	Neketa Bay, Shuyak I.	GX-17326	500	100	CH	upper component	Reger et al. 1992

Appendix B Late Holocene ^{14}C ages from prehistoric coastal archaeological sites at the Alaska subduction zone. *(Continued)*

AHRS nr (49-)	Site name	Lab nr	^{14}C age	1-σ error	Material dated[a]	Context	Reference
AFG 098	Neketa Bay, Shuyak I.	GX-17325	500	105	CH	upper component	Reger et al. 1992
AFG 098	Neketa Bay, Shuyak I.	GX-17331	570	60	CH	upper component	Reger et al. 1992
AFG 098	Neketa Bay, Shuyak I.	GX-17328	625	60	CH	upper component	Reger et al. 1992
AFG 098	Neketa Bay, Shuyak I.	GX-17327	950	65	grass, needles	lower component	Reger et al. 1992
AFG 098	Neketa Bay, Shuyak I.	GX-17329	1040	105	CH	lower component	Reger et al. 1992
AFG 098	Neketa Bay, Shuyak I.	GX-17324	1055	105	CH	lower component	Reger et al. 1992
AFG 098	Neketa Bay, Shuyak I.	GX-17330	1175	110	CH	lower component	Reger et al. 1992
AFG 119	—	Beta-42074	1000	80	?		Haggarty et al. 1991; Mills 1994
AFG 207	Sukoi Bay terrace	Beta-74849	2020	80	CH	upper component	Crowell & Mann 1996
AFG 207	Sukoi Bay terrace	Beta-74850	3570	60	CH	lower component	Crowell & Mann 1996
KAR 001	New Karluk	Beta-15014	290	60	WD	HF 6 (floor-plank)	Jordan & Knecht 1988; Mills 1994
KAR 001	New Karluk	Beta-8942	370	50	CH	from erosion profile/ TP	Mills 1994
KAR 001	New Karluk	Beta-15015	480	80	WD	HF 8 (floor-plank)	Jordan & Knecht 1988; Mills 1994
KAR 001	New Karluk	Beta-25599	630	50	WD	HF 9A (floor-plank)	unpublished
KAR 001	New Karluk	Beta-15016	740	80	WD	HF 10 (floor-plank)	Jordan & Knecht 1988; Mills 1994
KAR 001	New Karluk	Beta-25600	780	60	WD	?	Mills 1994
KAR 029	Larsen Bay	Beta-23767	450	70	carbon	structural depression	Crozier 1989; Mills 1994
KAR 029	Larsen Bay	Beta-23769	620	50	carbon	house floor	Crozier 1989; Mills 1994
KAR 029	Larsen Bay	Beta-23768	870	70	CH	hearth	Crozier 1989; Mills 1994
KAR 029	Larsen Bay	Beta-23765	990	60	CH	fire pit assoc. w/ house floor	Crozier 1989; Mills 1994
KAR 029	Larsen Bay	Beta-23766	1000	110	CH	fire pit assoc. w/ house floor	Crozier 1989; Mills 1994
KAR 029	Larsen Bay	Beta-23771	1290	80	CH	hearth in house floor	Crozier 1989; Mills 1994
KAR 029	Larsen Bay	Beta-23770	1310	70	carbon	house floor	Crozier 1989; Mills 1994
KAR 031	Old Karluk	Beta-15017	320	60	CH	exterior hearth; Level 3, midden	Mills 1994; rejected by Jordan, accepted by Mills 1994
KAR 031	Old Karluk	Beta-15690	430	60	CH	midden, L-3, Feature B	Mills 1994; rejected by Jordan, accepted by Mills 1994
KAR 031	Old Karluk	Beta-15691	980	60	WD	L-7, house floor plank	Jordan 1992; Mills 1994

Appendix B Late Holocene ^{14}C ages from prehistoric coastal archaeological sites at the Alaska subduction zone. *(Continued)*

AHRS nr (49-)	Site name	Lab nr	^{14}C age	1-σ error	Material dated[a]	Context	Reference
KAR 031	Old Karluk	Beta-8946	2010	70	WD	post from L-7 house floor	Jordan & Knecht 1988; Mills 1994
KAR 031	Old Karluk	Beta-8945	2540	60	CH	L-9	Jordan & Knecht 1988; Mills 1994
KAR 039		Beta-8943	2650	60	CH	TP	Haggarty et al. 1991; Mills 1994
KAR 048		Beta-8944	3050	70	CH	pit feature?	Mills 1994
KOD 145	Uyak	Beta-34281	1130	70	CH	hearth in House 2	Steffian 1992; Mills 1994
KOD 145	Uyak	Beta-25603	1140	90	WD	House 13 floor-plank	Steffian 1992; Mills 1994
KOD 145	Uyak	Beta-34283	1270	100	CH	hearth in House 1	Steffian 1992; Mills 1994
KOD 145	Uyak	Beta-25602	1310	70	CH	hearth in House 8	Steffian 1992; Mills 1994
KOD 145	Uyak	Beta-34282	1320	70	WD	outer rings from post in House 1	Steffian 1992; Mills 1994
KOD 224	Uganik I.	UGa-2823	1080	90	?	?	Haggarty et al. 1991; Mills 1994
KOD 224	Uganik I.	UGa-2820	3130	85	?	?	Clark 1984; Mills 1994
KOD 224	Uganik I.	UGa-2822	3365	70	?	?	Clark 1984; Mills 1994
XMK 006	Kukak	Beta-97002	720	70	CH	House 3	D Dumond, p.c. 2002
XMK 006	Kukak	I-1636	775	110	CH	House	Clark 1977; Mills 1994; Crowell & Mann 1996
XMK 006	Kukak	I-505	775	95	CH		Mills 1994; Crowell & Mann 1996
XMK 006	Kukak	I-1638	1075	100	CH	floor	Clark 1977; Mills 1994; Crowell & Mann 1996
XMK 006	Kukak	I-1637	1450	130	CH	floor	Clark 1977; Mills 1994; Crowell & Mann 1996
XMK 006	Kukak	I-1944	1460	95	CH	floor	Clark 1977; Mills 1994; Crowell & Mann 1996
XMK 018	Takli	I-3733	2810	100	CH		Clark 1977; Mills 1994; Crowell & Mann 1996
XMK 018	Takli	I-1941	2910	105	CH		Clark 1977; Mills 1994; Crowell & Mann 1998
XMK 020	Hook Point	I-1942	1680	100	CH	floor	Clark 1977; Mills 1994; Crowell & Mann 1996

Appendix B Late Holocene ^{14}C ages from prehistoric coastal archaeological sites at the Alaska subduction zone. *(Continued)*

AHRS nr (49-)	Site name	Lab nr	^{14}C age	1-σ error	Material dated[a]	Context	Reference
XMK 020	Hook Point	I-1943	3470	110	CH	hearth	Clark 1977; Mills 1994; Crowell & Mann 1997
XMK 030	Mink Island	Beta-122729	370	40	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-130090	400	60	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-149293	520	80	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-109926	540	60	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-130091	720	60	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-109929	850	60	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-109927	860	50	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-109928	860	140	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-114541	950	60	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-115542	970	50	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-109930	970	60	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-114544	1510	90	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-147721	1590	40	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-109931	1620	60	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-130085	1650	70	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-114545	1710	50	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-114543	1920	120	CH	upper midden	unpublished
XMK 030	Mink Island	WSU-5044	1925	50	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-130086	2010	60	CH	upper midden	unpublished
XMK 030	Mink Island	Beta-130102	3690	130	CH	lower midden	unpublished
XMK 047	Russian Anchorage	Beta-75314	640	90	CH		Crowell & Mann 1996
XMK 056	Russian Anchorage	Beta-74853	690	60	CH		Crowell & Mann 1996
XMK 056	Russian Anchorage	Beta-75318	1890	70	CH		Crowell & Mann 1996
XMK 058	Cape Gull	GX-17008	510	105	CH	split w/ GX-17009	Haggarty et al. 1991; Dekin et al. 1993
XMK 058	Cape Gull	GX-17009	550	85	CH	split w/ GX-17008	Haggarty et al. 1991; Dekin et al. 1993
		wt. mean & sd	*534*	*66*			
XMK 058	Cape Gull	GX-17006	525	60	CH	split w/ GX-17007	Haggarty et al. 1991; Dekin et al. 1993
XMK 058	Cape Gull	GX-17007	590	105	CH	split w/ GX-17006	Haggarty et al. 1991; Dekin et al. 1993
		wt. mean & sd	*541*	*52*			
XMK 058	Cape Gull	GX-17005	730	120	CH	split w/ GX-17004	Haggarty et al. 1991; Dekin et al. 1993
XMK 058	Cape Gull	GX-17004	750	110	CH	split w/ GX-17005	Haggarty et al. 1991; Dekin et al. 1993
		wt. mean & sd	*741*	*81*			
XMK 059	Kukak Bay Refuge Rock	Beta-74856	360	60	CH	midden	Crowell & Mann 1996
XMK 072	Takli Islet	GX-17214	3605	150	CH	split w/ GX-17215; midden	Dekin et al. 1993; Crowell & Mann 1996

Appendix B Late Holocene ^{14}C ages from prehistoric coastal archaeological sites at the Alaska subduction zone. *(Continued)*

AHRS nr (49-)	Site name	Lab nr	^{14}C age	1-σ error	Material dated[a]	Context	Reference
XMK 072	Takli Islet	GX-17215	3875	175	CH	split w/ GX-17214; midden	Dekin et al. 1993; Crowell & Mann 1996
		wt. mean & sd	*3719*	*113*			
XMK 075	Takli Island	GX-17212	2175	205	CH	split w/ GX-17213	Dekin et al. 1993; Crowell & Mann 1996
XMK 075	Takli Island	GX-17213	2020	180	CH	split w/ GX-17212	Dekin et al. 1993; Crowell & Mann 1996
		wt. mean & sd	*2087*	*135*			
XMK 106	Tiny Island Village	Beta-74857	1530	80	CH		Crowell & Mann 1996
XMK 107	Tiny Island II	Beta-83699	620	60	CH		Crowell & Mann 1996
XMK 111	Tiny Island Passage	Beta-75315	3270	70	CH		Crowell & Mann 1996
XMK 113	Kinak River Wet Site	Beta-74851	210	60	CH		
XMK 113	Kinak River Wet Site	Beta-74852	960	60	CH		
XMK 115	Aguchik Island Cove	Beta-74664	3560	80	CH	non-cultural (RSL estimate @ 0.6 m asl)	Crowell & Mann 1996
XMK 116	Aguchik Island Tombolo	Beta-74673	2970	60	CH	non-cultural (RSL estimate @ 1.8 m asl)	Crowell & Mann 1996
XMK 118	Kukak Point Village	Beta-75319	900	60	CH	midden	Crowell & Mann 1996
XMK 119	Kaflia River mouth	Beta-75320	3350	90	CH	midden	Crowell & Mann 1996
XMK 120	Kaflia River mouth	Beta-75321	460	70	CH	midden	Crowell & Mann 1996

[a]CH = charcoal (wood?); CM = charred material; BO = bulk organic; GR = grass; ANT = antler; CW = charred wood; BB = birch bark; WD = wood.

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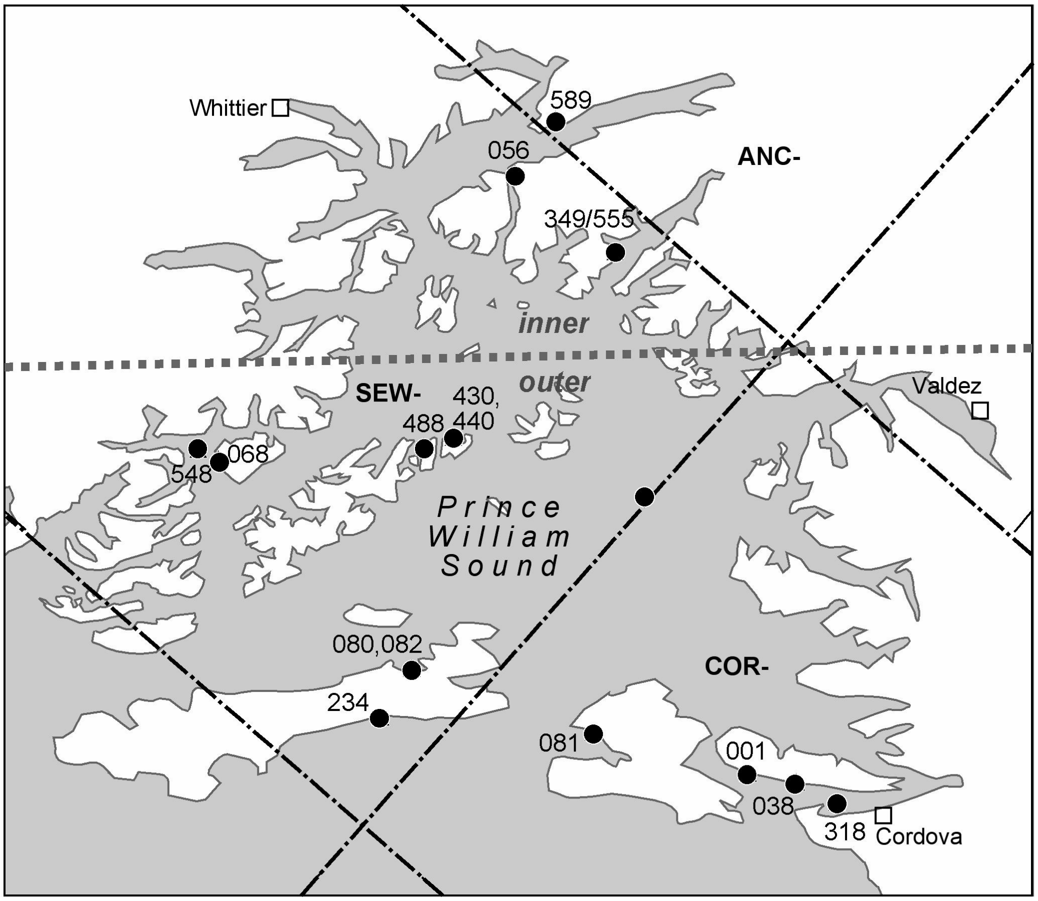
APPENDIX C

Locations of Dated Prehistoric Archaeological Sites in the Prince William Sound (PWS), Kenai (KEN), and Kodiak-Katmai (KOKA) Tectonic Segments, Southern Alaska



Dated prehistoric coastal archaeological sites in the PWS segment

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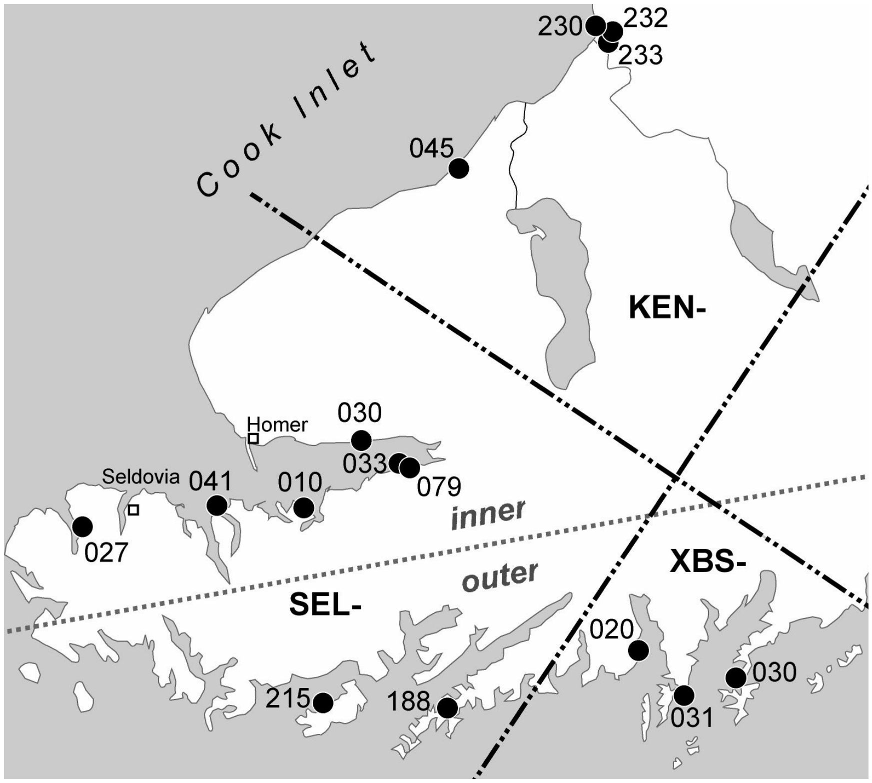
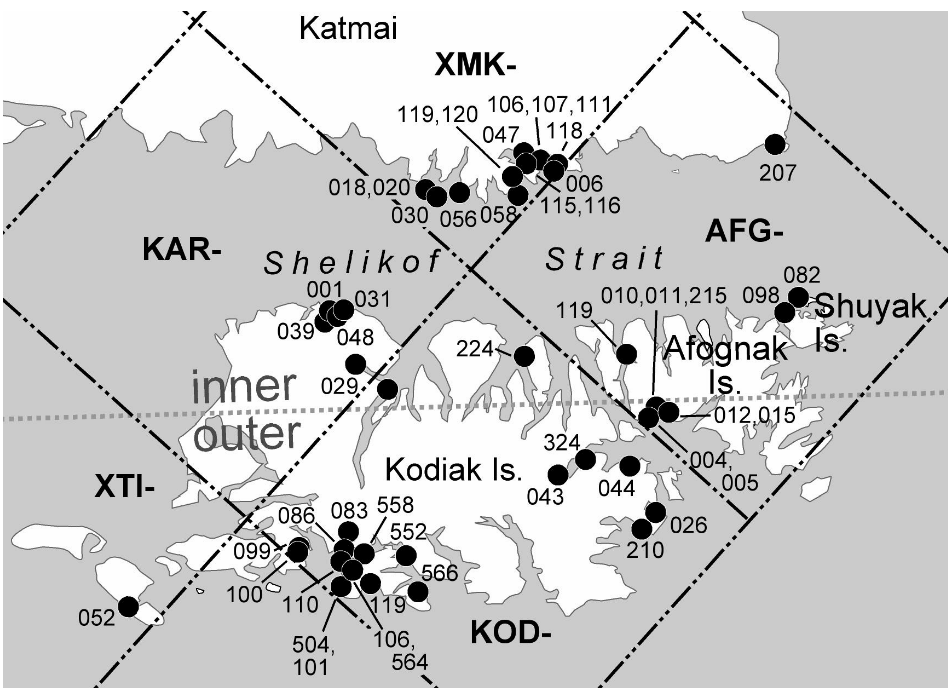


Dated prehistoric coastal archaeological sites in the KEN segment



Dated prehistoric coastal archaeological sites in the KOKA segment

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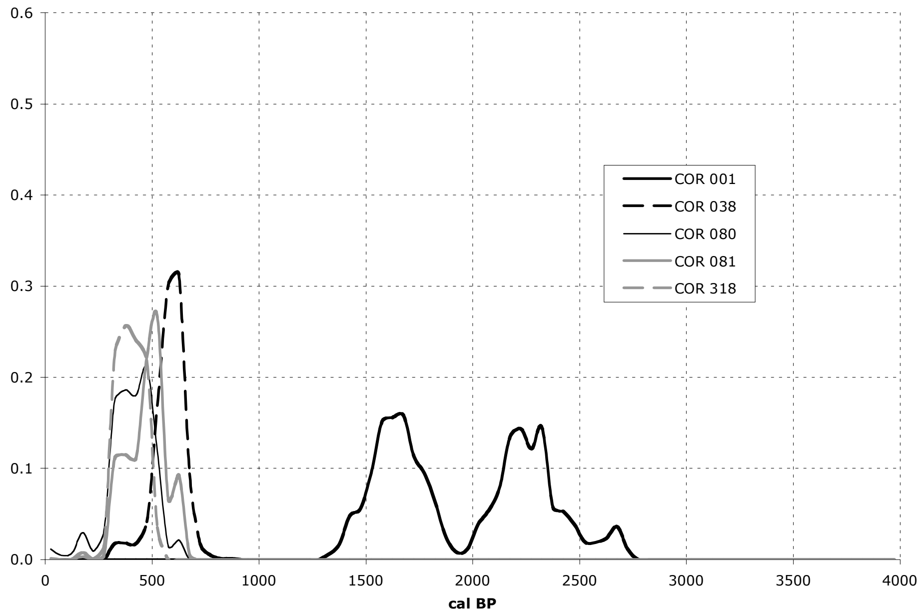
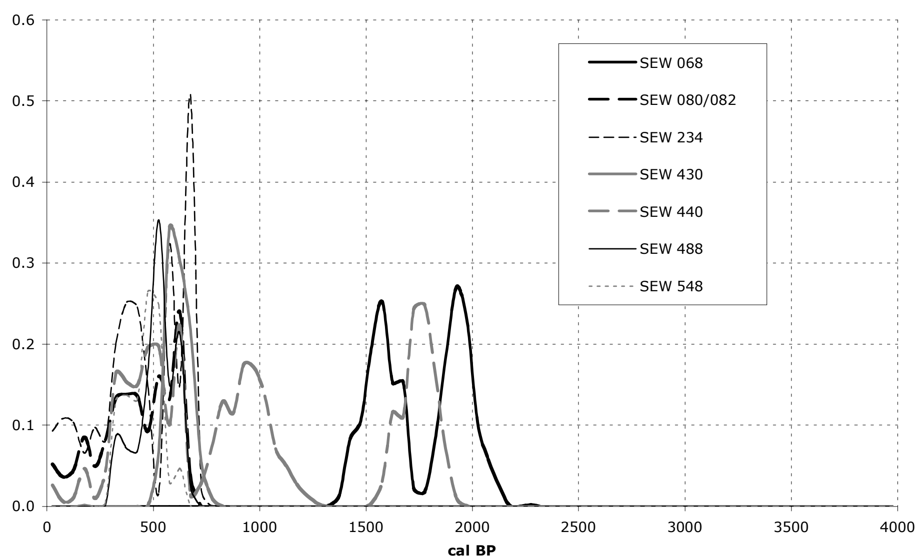
APPENDIX D

Coastal Prehistoric Archaeological Sites, Southern Alaska: ^{14}C Age Distributions



Probability density function (PDF) of calibrated ^{14}C ages from prehistoric villages and camps on the outer coast of the Prince William Sound segment (I).



PDF of calibrated ^{14}C ages from prehistoric villages and camps on the outer coast of the Prince William Sound segment (II).

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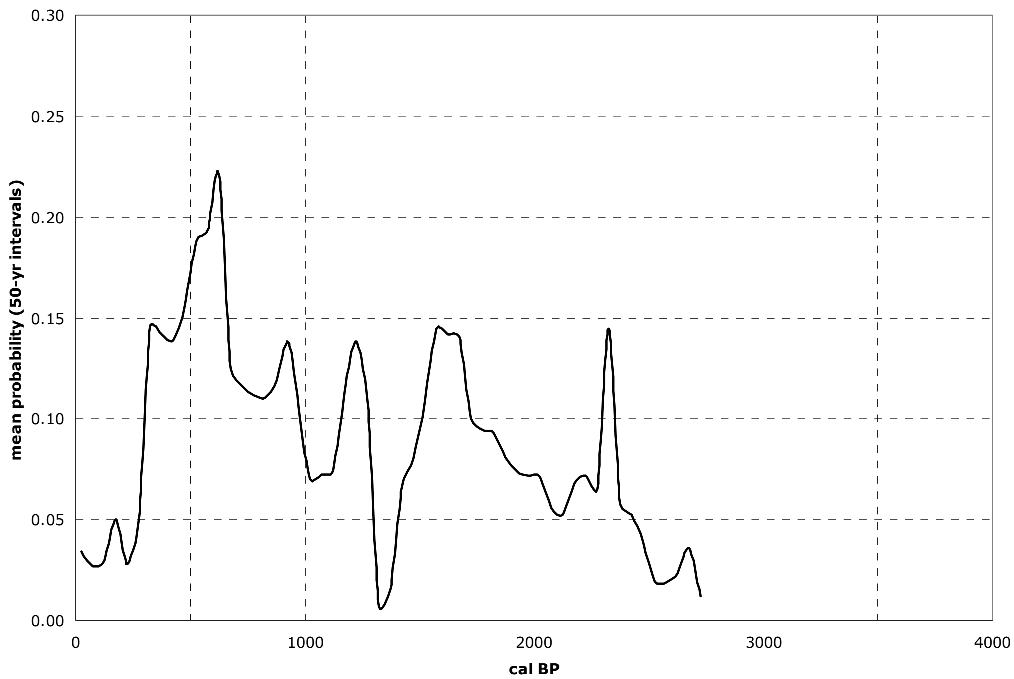
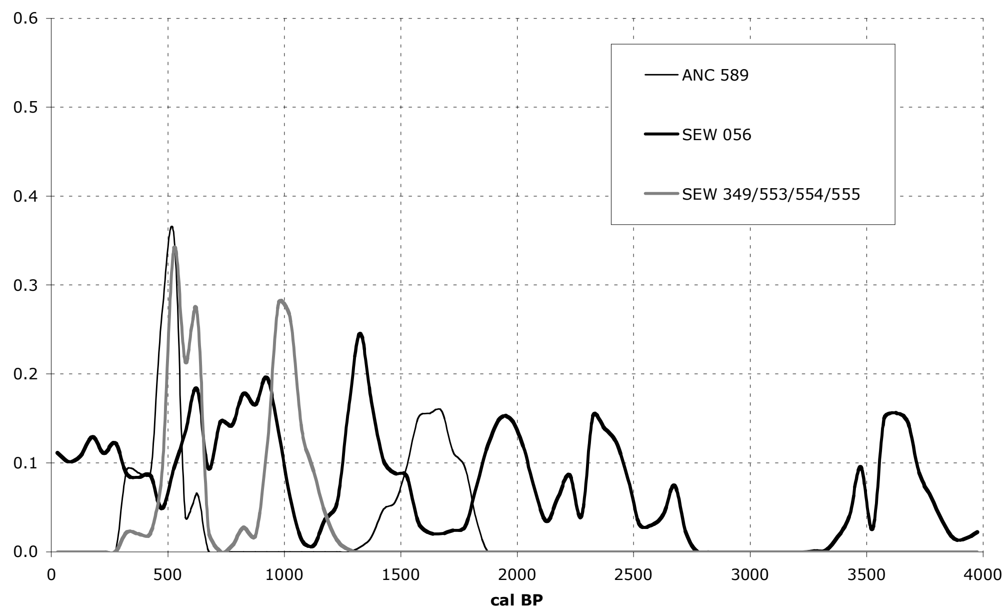


Composite PDF of calibrated ^{14}C ages from the outer coast of the Prince William Sound segment



PDFs of calibrated ^{14}C ages from prehistoric villages and camps on the inner coast of the Prince William Sound segment

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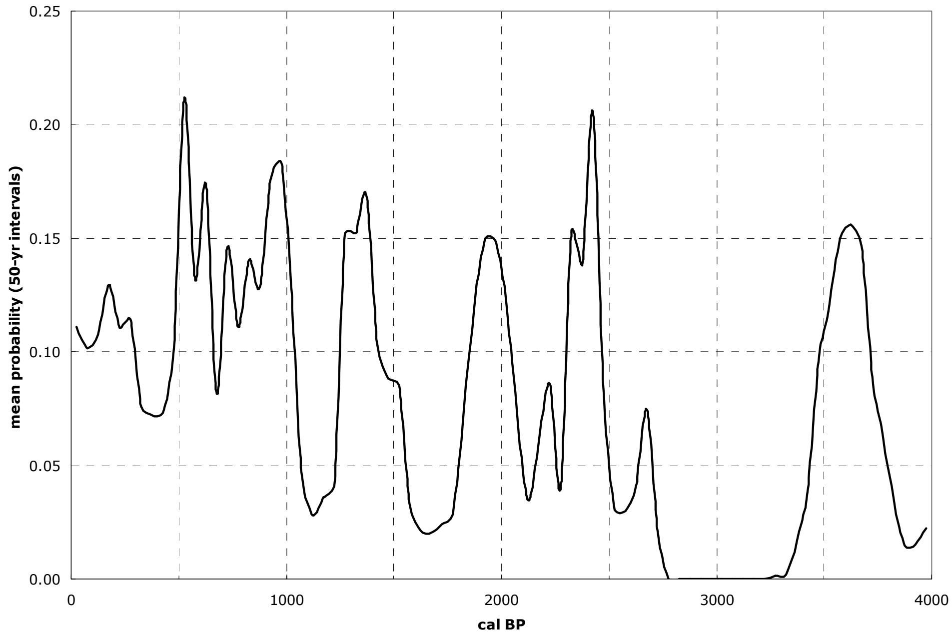

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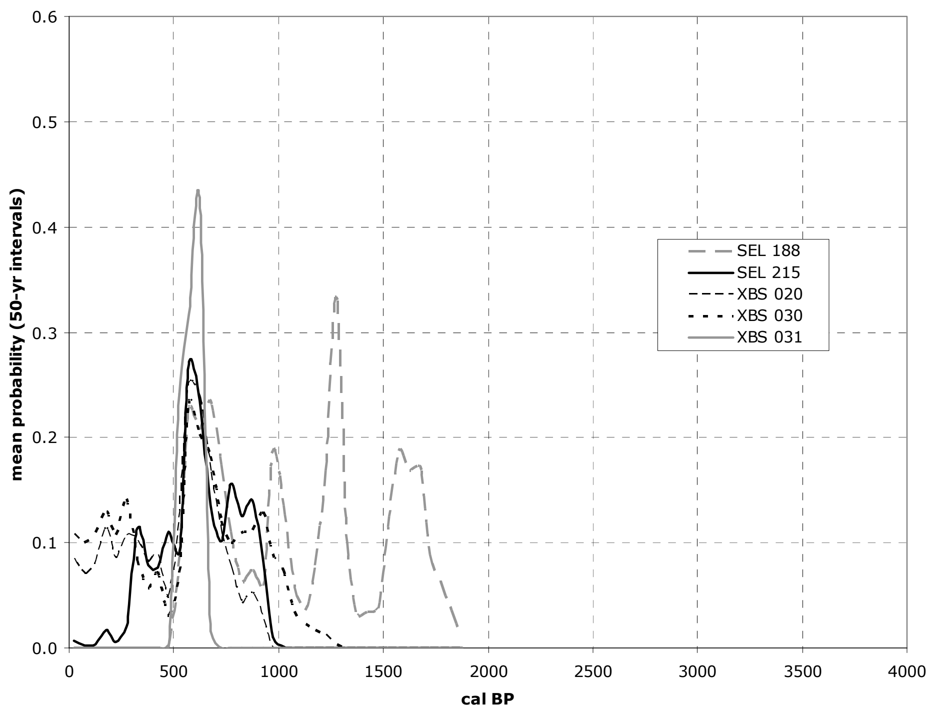

PDFs of calibrated ^{14}C ages from prehistoric villages and camps on the outer coast of the Kenai segment

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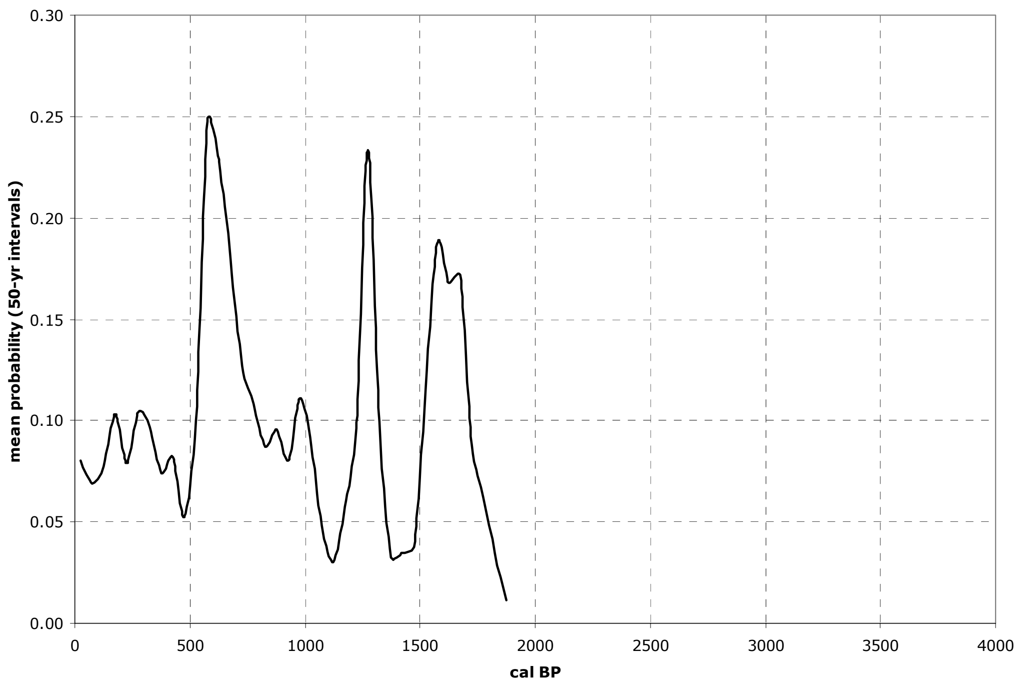

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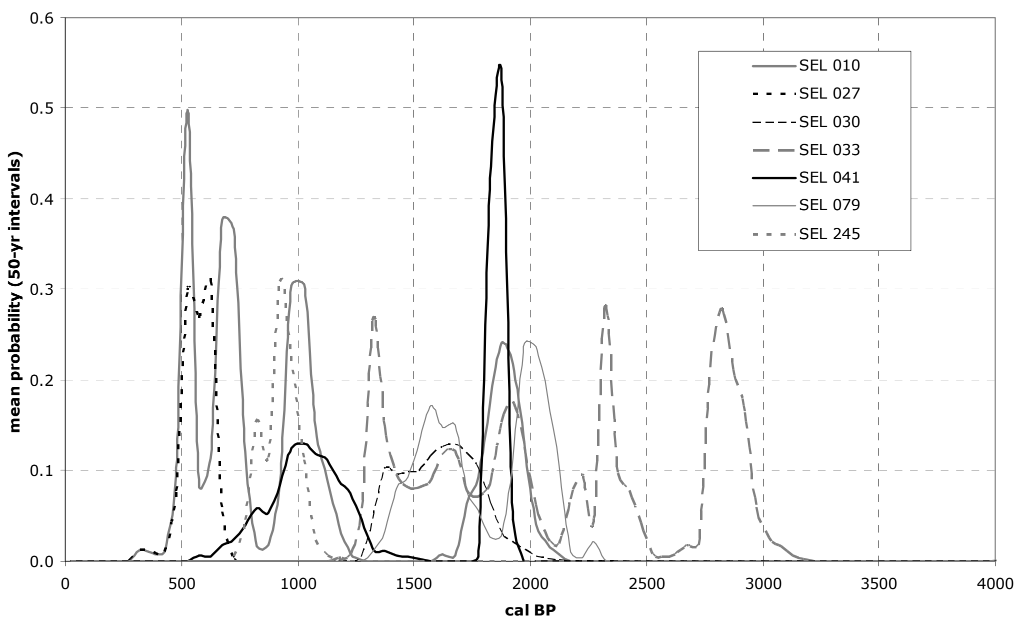

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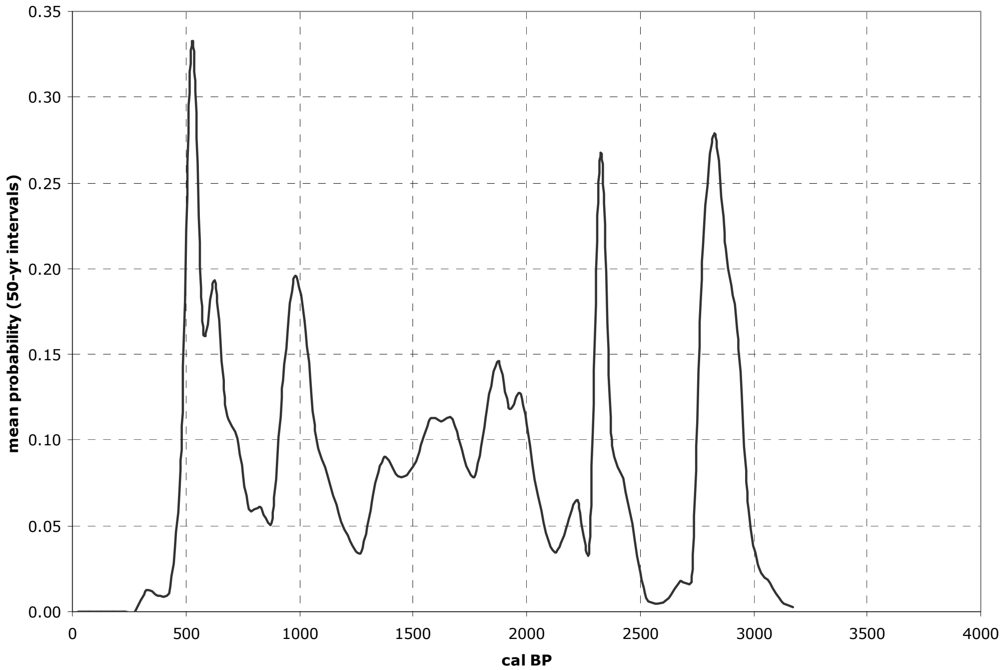

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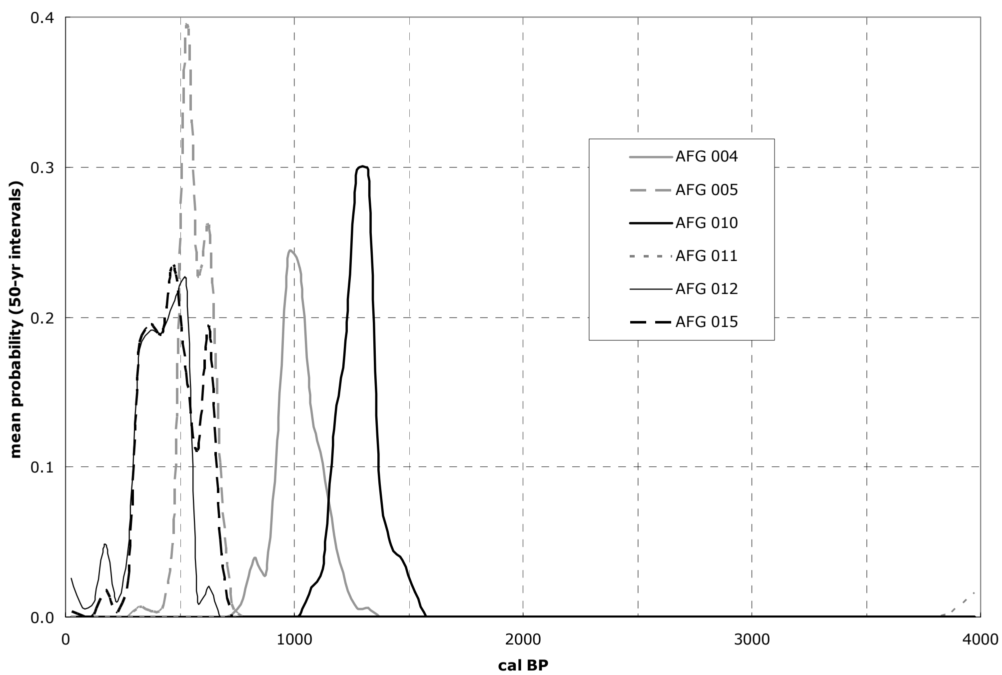

PDFs of calibrated ^{14}C ages from prehistoric villages and camps on the outer coast of the Kodiak-Katmai segment (I)

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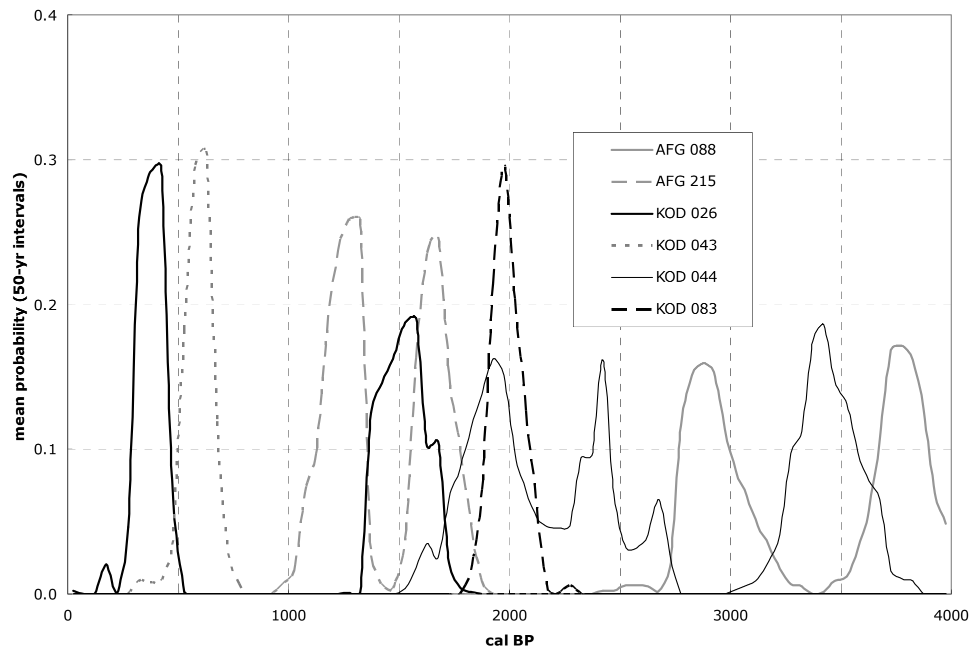

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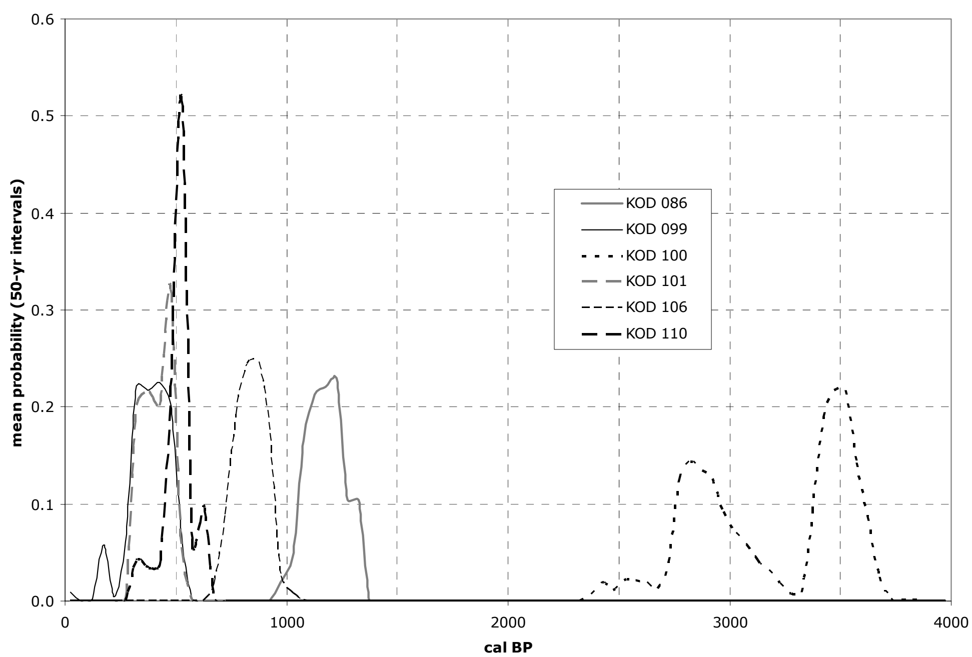

PDFs of calibrated ^{14}C ages from prehistoric villages and camps on the outer coast of the Kodiak-Katmai segment (III)

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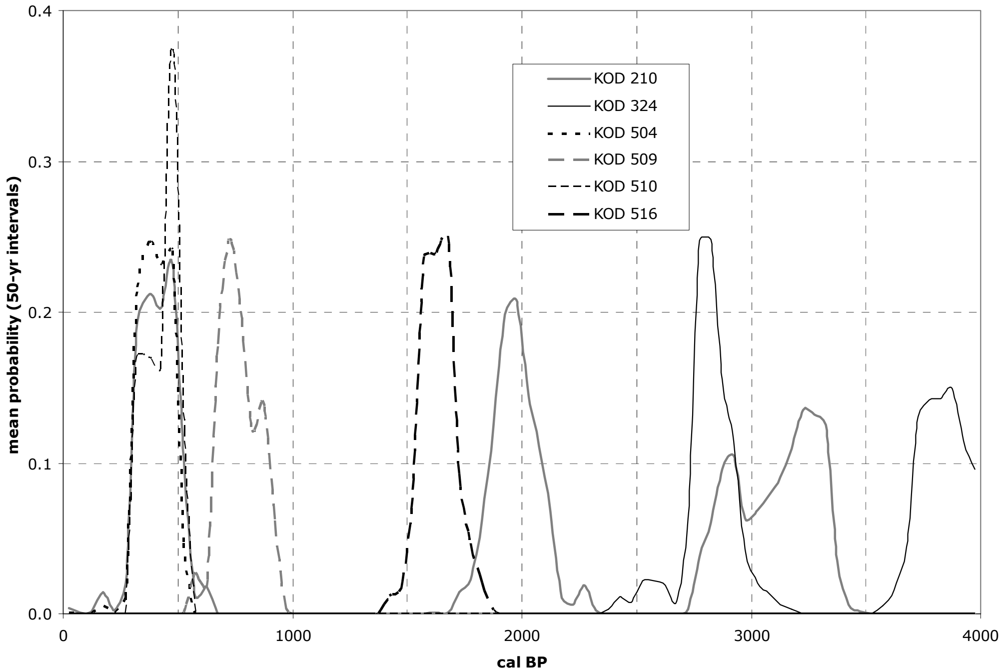

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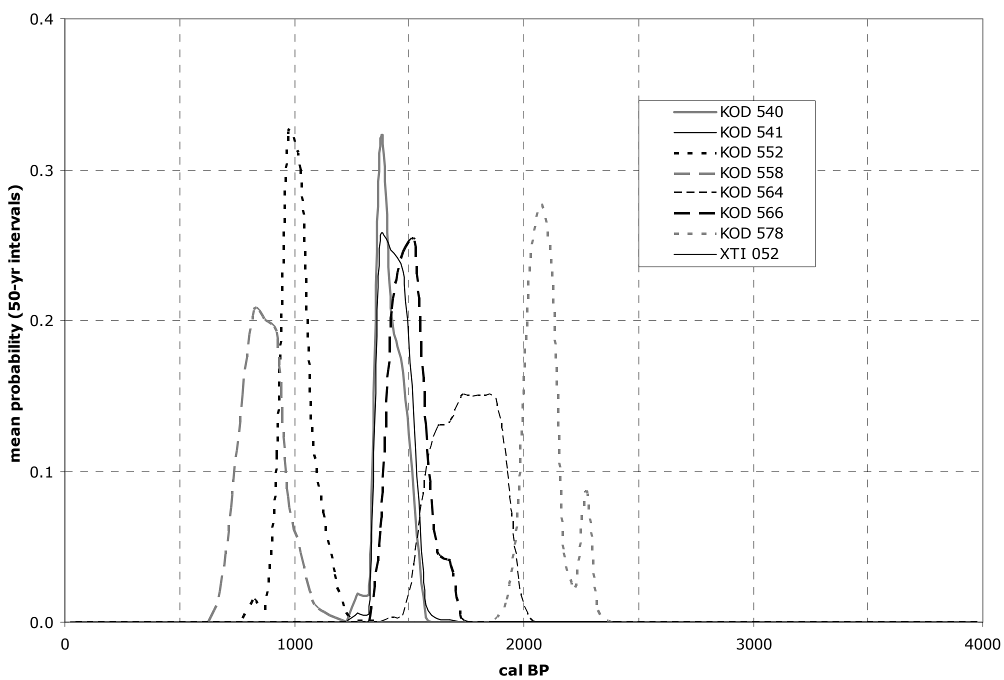

PDFs of calibrated ^{14}C ages from prehistoric villages and camps on the outer coast of the Kodiak-Katmai segment (V)

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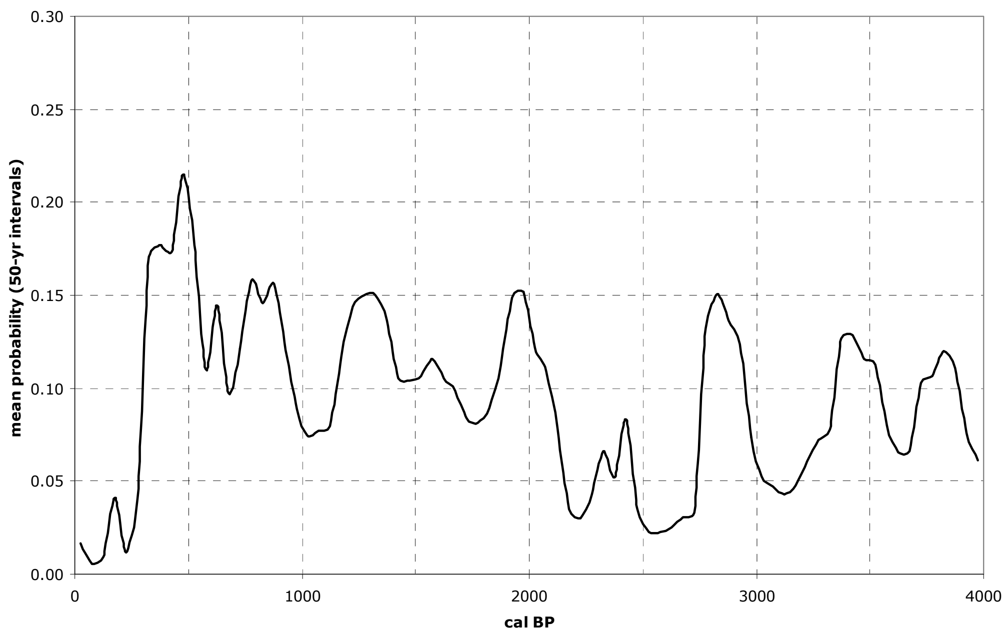

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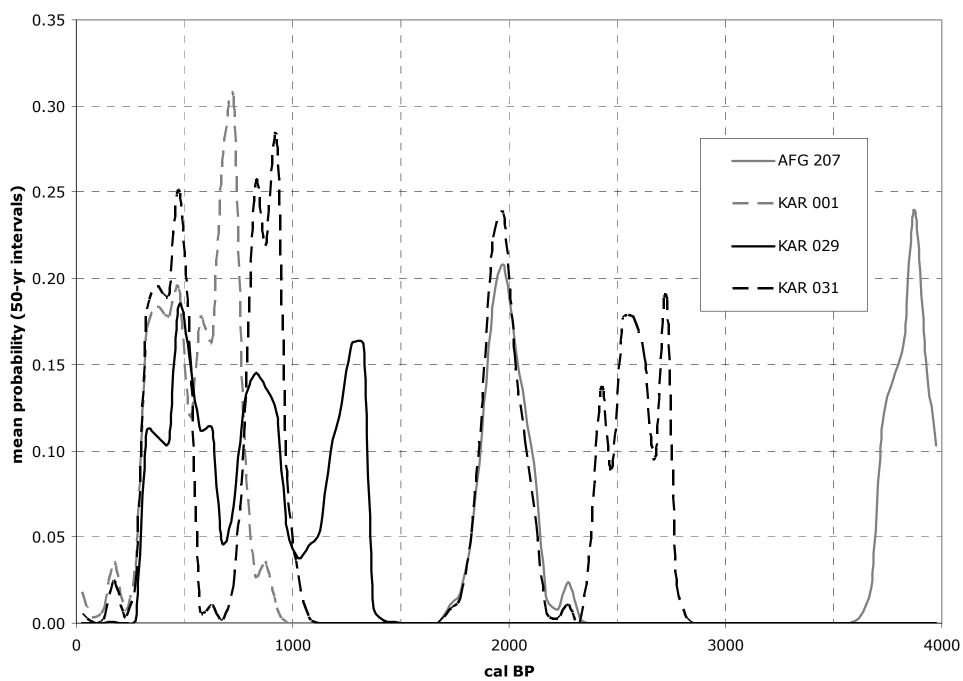

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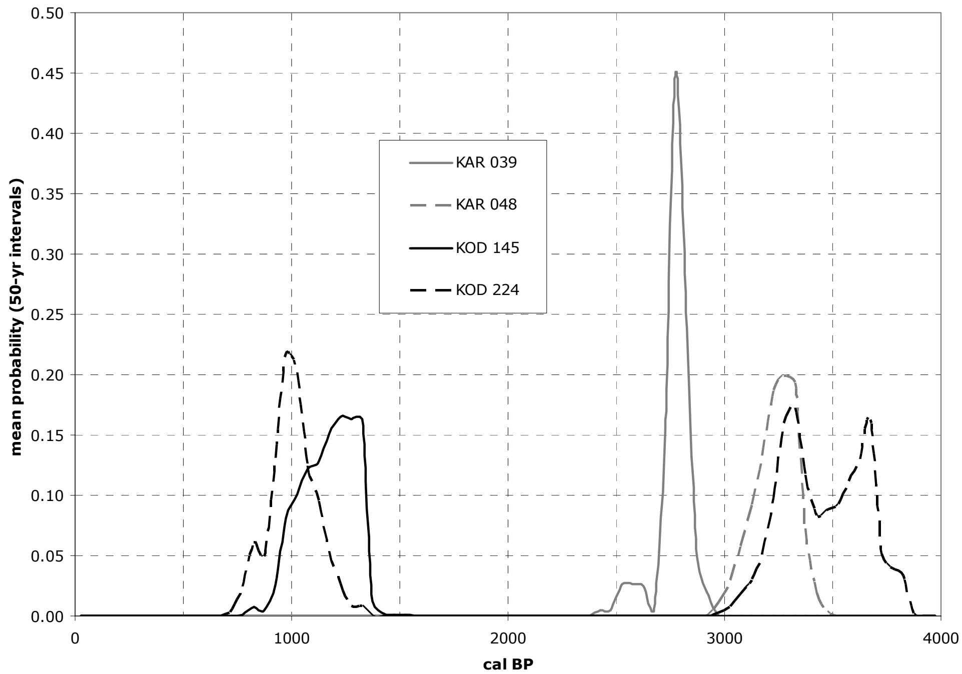

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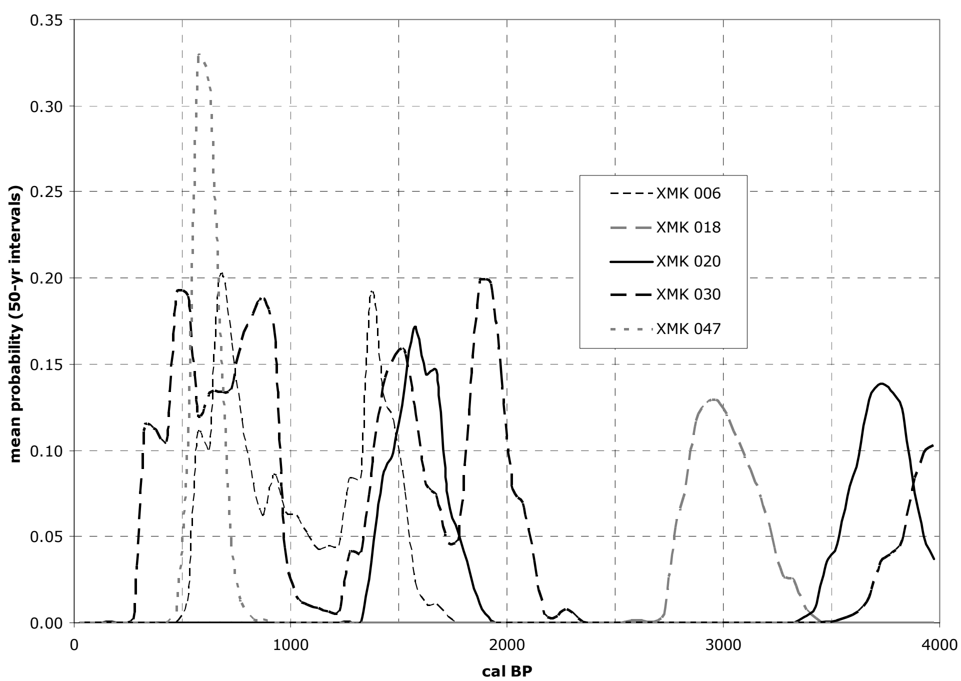

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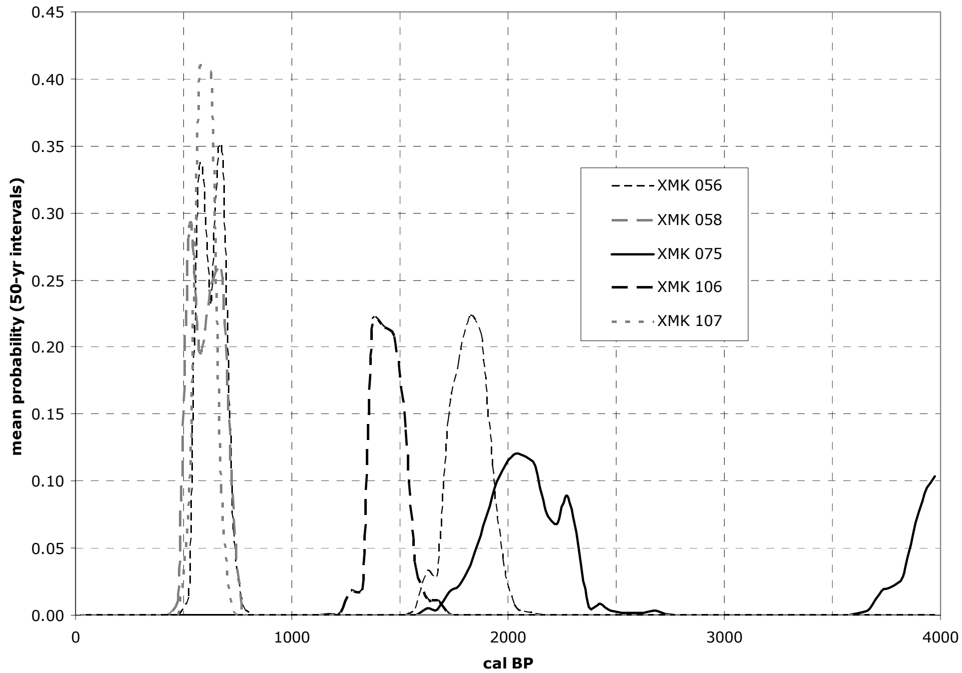

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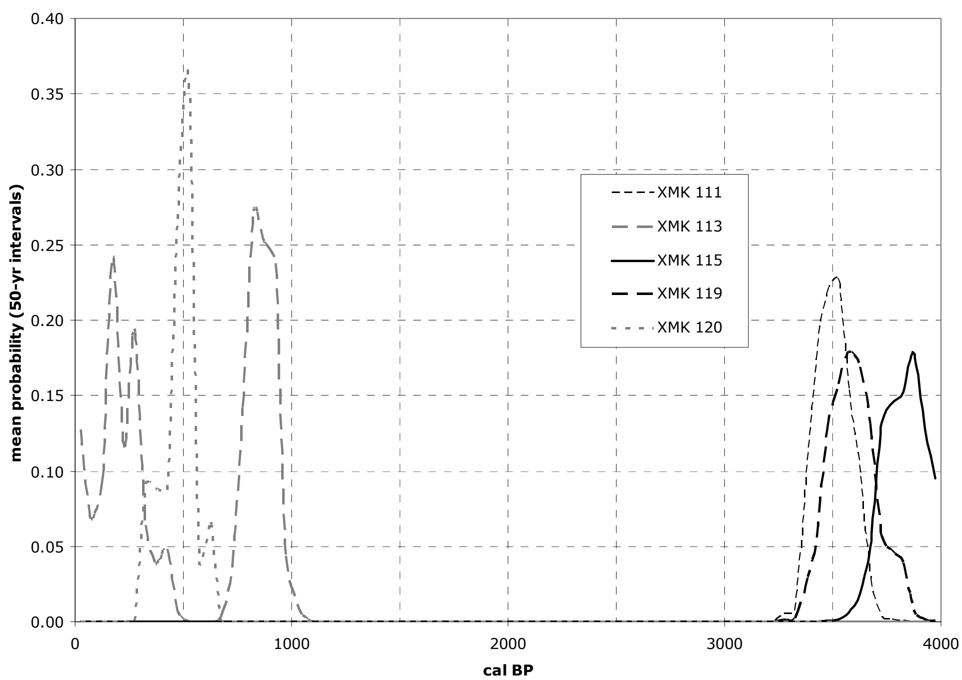

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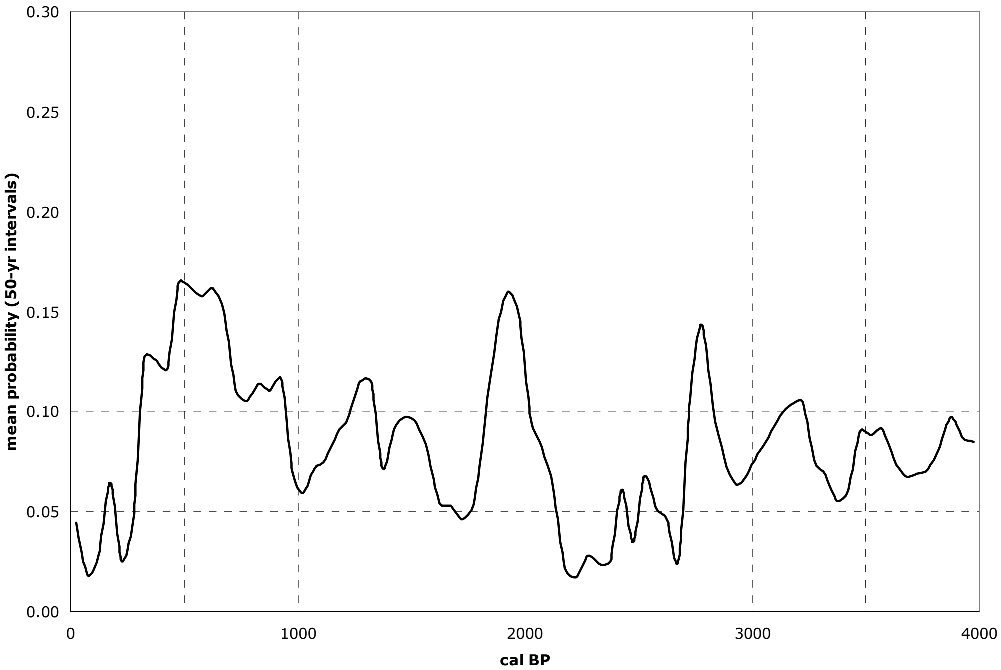

Composite PDF of calibrated ^{14}C ages from the inner coast of the Kodiak-Katmai segment

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