THE EVOLUTION OF AN AVERAGE SOLAR GRANULE

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Abstract

High-resolution photographic spectra of the center of the solar disk have been obtained with the Vacuum Tower Telescope at Sacramento Peak Observatory. Two weak iron lines and the neighboring continuum were recorded with 40 sec time resolutions and better than 1" spatial resolution over a period of 40 min. Intensity and velocity fluctuations were obtained in the two lines and continuum as a function of time and space, and 300 sec oscillations were filtered out. The resulting fluctuations, due solely to granulation, were assembled into an ensemble average of the center of a granule and the center of an intergranular lane, as a function of time. The intensity-fluctuation data have been analyzed through calculation of model line profiles to yield temperature fluctuations in a granule as functions of time and height. We find that the line parameters are distinctly out of phase with continuum brightness, so that, for example, maximum brightness at line center occurs approximately 100 sec prior to maximum continuum brightness. A series of one-dimensional model atmospheres representing the granule at various stages of its lifetime is presented.

OBSERVED SOLAR SPECTRAL LINE ASYMMETRIES AND WAVELENGTH SHIFTS DUE TO CONVECTION

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Abstract

Convective motions are manifest in the solar spectrum as slight spectral line asymmetries and wavelength shifts. These have been studied for 311 Fe I lines. Most lines are blueshifted because the larger contribution of blueshifted photons from

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