

Earth as an Extrasolar Planet: South Pole Advantages

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Abstract. We could observe the Earth as an extra-solar planet, viewing Earthshine on the dark side of the Moon, at the Pole, in winter.

A small telescope can measure H₂O, O₂, O₃, chlorophyll, air column density, clouds, continents, oceans, weather variations, and rotation period. This can be done only from the Pole, and in the coming few years of the lunar cycle, owing to the Earth-Moon-Sun geometry. The observations will validate analysis methods for the Terrestrial Planet Finder coronagraph.

Reflectivity variations (see model) will be strong; several-day observations are possible only at the Pole. Enhanced blue reflectivity from Rayleigh scattering gives the column abundance of molecules. Reflectivity from green land plants gives the “chlorophyll” feature. O₂ has 2 strong absorptions. Stratospheric O₃ gives the broad feature 0.6 μ m. H₂O has 3 major bands. A primitive Earth might show CH₄ and CO₂ as well. Life on Earth produces abundant O₂, and no other known process competes except to produce relatively much smaller amounts. The strong O₂ bands are therefore good signs of the presence of plant life, along with the “chlorophyll” feature.

