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Circulation, cloud, and spectra: a first look at a 3-D model exo-Earth

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Several Earth-like planets outside the solar system have recently been detected. It is estimated that roughly 35% of stars harbor Earth-like planets; hence, many more are expected to be detected in the near future. To assess the detectability of biosignatures that may be present on these planets, we have performed a series of general circulation model (GCM) simulations of putative “extrasolar Earths”. These planets are identical in all respects to the (model) Earth – except for different rotation periods. Such planets have markedly different general circulation and correspondingly different temperature, cloud, and species distributions. In this work, the outputs from the GCM simulations are used to compute model spectra. Such synthetic spectra can be useful for guiding and interpreting observations.