Detection Of Extrasolar Planets Using Spaceborne Transit Photometry

Edward W. Dunham; Lowell Observatory

Extrasolar planets can be detected indirectly by observing the periodic decrease in brightness of the parent star due to obscuration by a transiting planet. This effect is quite small, ranging from a 1brightness drop for Jupiter transiting the Sun, to 0.008% for the Earth or Venus transiting the Sun. Also, the planetary orbit must be close to edge-on for transits to occur, implying that rather large stellar samples must be observed for a period of several years.

Atmospheric scintillation and extinction, weather, and the diurnal and annual cycles limit the usefulness of groundbased photometric detection efforts to relatively large planets with relatively short periods. A spaceborne imaging photometer located in heliocentric orbit and pointed near the ecliptic pole is essentially free from all of these effects and is an extremely powerful tool for detection of extrasolar planets as small as the terrestrial planets in orbit about solar-type stars. Two missions are proposing to exploit the spaceborne photometric technique. COROT is a CNES/ESA project with a combined asteroseismology and planet detection mission, and is currently under development. Kepler is a proposed NASA Discovery mission with much greater planet detection capability.

The advantages, limitations, and challenges of extrasolar planet detection using spaceborne photometry will be discussed in the context of other planetary detection techniques.