Extrasolar Planets and Astrophysical Discs
Problem Set 6

March 2010

Problem 1

Absoption lines in the spectrum of a Solar-type star are observed to redshift and blueshift repeatedly, with an amplitude which varies sinusoidally and which corresponds to a peak radial velocity of 1 ms^{-1}. The period of variation is 300 days. Estimate the mass of the orbiting planet.

Photometric monitoring of the star described in the previous subquestion shows that there is a periodic reduction of the observed stellar luminosity with a period of 300 days. The degree of dimming corresponds to 0.01 percent of the stellar luminosity. What can be inferred about the physical nature of the planet. Speculate on the composition of the planet.

Assuming that an efficient mechanism exists on the planet for redistribution heat around its surface, estimate the effective temperature of the planet. Comment on the significance of your result.

A number of processes or phenomena may cause the temperature of the planet to differ from the estimate obtained in answer to the previous subquestion. Describe briefly three such processes/phenomena, and their qualitative effect on the estimated temperature.