Water Identified in Extrasolar Planet Atmosphere

Flagstaff, Ariz. - For the first time, water has been identified in the atmosphere of an extrasolar planet. Through a combination of previously published Hubble Space Telescope measurements and new theoretical models, Lowell Observatory astronomer Travis Barman has found strong evidence for water absorption in the atmosphere of transiting planet HD209458b. This result was recently accepted for publication in the Astrophysical Journal (http://lanl.arxiv.org/abs/0704.1114).

"We now know that water vapor exists in the atmosphere of one extrasolar planet and there is good reason to believe that other extrasolar planets contain water vapor", said Barman.

Water vapor (or steam) has been expected to be present in the atmospheres of nearly all of the known extrasolar planets, even those that orbit closer to their parent star than Mercury is to our Sun. For the majority of extrasolar planets, their close proximity to their parent star has made detecting water and other compounds difficult. The identification reported here takes advantage of the fact that HD209458b, as seen from Earth, passes directly in front of its star every three and a half days. As a planet passes in front of a star, its atmosphere blocks a different amount of the starlight at different wavelengths. In particular, absorption by water in the atmosphere of a giant planet makes the planet appear larger across a specific part of the infrared spectrum compared to wavelengths in the visible spectrum. An analysis of visible and infrared Hubble data carried out last year by Harvard student Heather Knutson made possible a direct comparison to new theoretical models developed by Barman at Lowell Observatory. This ultimately led to the identification of water absorption in a planet 150 light years from Earth.

"It is encouraging that theoretical predictions of water in extrasolar planets seem to agree reasonably well with observations", said Barman.

This research was supported by NASA's Origins of Solar System program.

First published: April 10, 2007