

CONTROL ID: 2254848

TITLE: Atmospheric mass loss from Hot Jupiters: chemical reactions and a new hypothesis for the origin of water in habitable planets

ABSTRACT BODY:

Abstract Body: The chemistry along the mass loss of Hot Jupiters is generally considered to be simple, consisting mainly of atoms, prevented from forming more complex species by the intense radiation field from their host stars. However, the results of our chemical reaction simulations, involving 56 species and 566 reactions, indicate that many simple molecules, including H_2O^+ and OH^+ , are formed along the mass loss of HD 209458 b and analogs, in a region farther away from the planet, where the temperature is lower ($T < 2000$ K). Our simulations included benzene formation reactions; the results indicate that carbon chain species are not formed in the mass loss of HD 209458 b. We also formulate a new hypothesis for the origin of water on the surface of habitable planets in general: chemical interaction of their primordial atmospheres with hydrogen and oxygen ions from the atmospheric mass loss of primordial, low density Hot Jupiters. This mechanism could have possibly operated in the Solar System and accounted for the formation of the oceans of the Earth.

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PRESENTATION TYPE: Poster