The Role of Water in Planetary Science

January 31, 2007

Talk open to everyone: **12:00 noon - 1:00pm**

Discussion of associated readings afterward (1pm-2pm)

To see the list of associated readings, go to the CIPS website: http://cips.berkeley.edu/events

THE DELIVERY OF WATER FROM THE ASTEROID BELT DURING TERRESTRIAL PLANET ACCRETION

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Many mechanisms have been suggested to explain the origin of water on Earth. I will provide a brief review of several proposed mechanisms, and focus in particular on the promising hypothesis that the bulk of the Earth's water was delivered from the asteroid belt region during its formation. Dynamical simulations suggest that substantial amounts of material from the asteroid belt, including potentially water-rich material from beyond ~2.5 AU, can be delivered to the terrestrial planets during accretion. I will present the results of new, high-resolution N-body simulations that show that sufficient quantities of asteroidal material are delivered to the terrestrial planets to explain the Earth's water budget. In addition to explaining the abundance of water on Earth as a natural consequence of planetary accretion, this mechanism is consistent with a range of geochemical evidence. For example, the D/H ratio of material from the asteroid belt is the same as that in the Earth's oceans. My simulations also show that the majority of the water is delivered in one or more large impacts before the end of differentiation, rather than as a 'late veneer' of material, and the small amount of material that does arrive as a late veneer is consistent with the abundance of siderophile elements such as Osmium in the Earth's mantle. Thus, asteroidal material is a likely source for the majority of water on Earth, as well as that present (or once present) on the other terrestrial planets.

Weekly seminars organized by Mate Adamkovics (Astronomy) & Sarah Zaranek (EPS) & sponsored by CIPS.