Geophysical Research Abstracts,
Vol. 10, EGU2008-A-04792, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-04792
EGU General Assembly 2008

Habitability of Enceladus: Planetary Conditions for Life

C. D. Parkinson (1), M.-C. Liang (2), and **Y. L. Yung** (3)
(1) University of Michigan, (2) Academia Sinica, (3) California Institute of Technology

The prolific activity and presence of a plume on Saturn's tiny moon Enceladus offers us a unique opportunity to sample the interior composition of an icy satellite, and to look for interesting chemistry and possible signs of life. Based on studies of the potential habitability of Jupiter's moon Europa, icy satellite oceans can be habitable if they are chemically mixed with the overlying ice shell on Myr time scales. We hypothesize that Enceladus' plume, tectonic processes, and possible liquid water ocean may create a complete and sustainable biogeochemical cycle that may allow it to support life. We discuss evidence for surface/ocean material exchange on Enceladus based on the amounts of silicate dust material present in the Enceladus' plume particles. Microphysical cloud modeling of Enceladus' plume shows that the plume particles originate from a region of Enceladus' surface where the temperature exceeds 190 K. This could be consistent a shear-heating origin of Enceladus' tiger stripes, which would indicate extremely high temperatures (˜273 K) in the subsurface, leading to the generation of subsurface liquid water, chemical equilibration between surface and subsurface ices, and crustal recycling on a time scale of 1 to 5 Myr. Alternatively, if the tiger stripes form in a mid-ocean- ridge-type mechanism, a half-spreading rate of 1 m/yr is consistent with the observed regional heat flux of 250 mW m-2 and recycling of south polar terrain crust on a 1 to 5 Myr time scale as well.