FNRS Astrobiology Contact Group workshop: "Water and Habitability"

:

November 20th 2008. Planetarium (Brussels).

(Details at www.astrobio.oma.be)

The theme of the second workshop of the FNRS Astrobiology contact group is "water and habitability". **All contributions related to astrobiology, the study of the origin, evolution and distribution of life in the universe, are welcome**. Please find below a summary of topics related to the concept of habitability, from the planetary to the cellular scale. **Abstracts should be submitted to v.dehant@oma.be and ej.javaux@ulg.ac.be before November 1st 2008.**

Habitability: from stars to cells

E J. Javaux & V Dehant (*Astronomy and Astrophysics Review*, accepted)

"To determine where to search for life in our solar system or in other extrasolar systems, the concept of habitability has been developed, based on the only sample we have of a biological planet-the Earth. This habitability concept can be considered from different scientific perspectives and on different spatial and time scales.

Important geodynamic processes may affect the habitability conditions of a planet. The dynamic processes, e.g. internal dynamo, magnetic field, atmosphere, plate tectonics, mantle convection, volcanism, meteorite impacts, and erosion, modify the planetary surface, the possibility to have liquid water, the thermal state, the energy budget, and the availability of nutrients. They thus play a role in the persistence of life on a planet.

Earth had a liquid water ocean and some continental crust in the Hadean between 4.4 and 4.0 Ga (Ga: billions years ago), and might have been habitable very early on. The origin of life is not understood yet but the earliest traces of life are early to late Archean (3.8-2.7 Ga). Studies of early Earth habitats documented in the rock record where life traces have been discovered provide information about possible habitats suitable for life beyond Earth.

The extreme values of environmental conditions in which life thrives today can also be used to characterize the "envelope" of life and the range of potential extraterrestrial habitats. The requirement of nutrients by life for biosynthesis of cellular constituents and for growth, reproduction, transport, and motility might suggest that a dynamic and rocky planet with erosion of relief, liquid water alteration, and runoff is required to sustain life (as we know it).

The concept of habitability is very Earth-centric, as we have only one biological planet to study. However, life elsewhere would most probably be based on organic chemistry and leave traces of its past or recent presence and metabolism by modifying microscopically or macroscopically the physico-chemical characteristics of its environment. The extent to which these modifications occur will determine our ability to detect them in astrobiological exploration. Looking at major steps in the evolution of life might help determining the probability of detecting life (as we know it) beyond Earth and the technology needed to detect its traces, be they morphological, chemical, isotopic or spectral."