Life on an Inclined Earth (the LIE project)

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Proposal abstract

The constraints of Earth-like life from a planetary perspective are not well known. Examining the various planetary parameters that effects life is important in order to understand Earth-life and under what conditions we might expect to find it.

We propose to model the life conditions of an alternative Earth that early in its development got hit by a body that gave it an obliquity of 90°, didn't form a moon, but instead made the planet tidally locked to its sun.

In light of the recent advances in the planetary sciences, notably the detection of (giant) exoplanets, it seems reasonable to assume that also terrestial planets (although none has yet been detected) should be subject to just as wide a variety of parameters as are the giant extrasolar planets we detect.

One of the factors that affects life on Earth is the *obliquity*[1] of the planet. Earth's current obliquity not only presents life with relatively small seasonal changes and mild temperature differences, but the presence of Earth's big moon also makes this condition very stable in time. The current theories for the formation of the moon suggests that a large body hit the Earth short after its formation. This impact gave it its rotation, tilt and formed the moon which among other things stabilize its obliquity.

The proposed project analyzes the conditions for life on Earth if this one event had created another outcome, as described in the introduction.

The project will involve the cooperation of an international team of transdiciplinary experts. The *Astronomers* will calculate the orbital behaviour and stability of the system, the stellar fluxes over the surface and make assumptions about the magnetic field, based on the current Earth parameters and the effects of the changed obliquity. These results are used by *Geologists*, *Geophysicists* and *Geochemists* not only to examine the feasability of Life on the planet but also to numerically model the very special atmospheric and geological properties found on such a planet, such as cloud formation, movement of materials between the hemispheres and geological activity. Finally, the *Biologists* work with the output parameters from the previous models to study the conditions for life on the planet.

[1] Obliquity is the angle of the rotation axis relative to the normal of the plane of the orbit.