EPSC Abstracts
Vol. 8, EPSC2013-99, 2013
European Planetary Science Congress 2013

Biospheric energization and stability

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Abstract

We utilize the physical properties of a hypothetical molecular *schema* giving rise to an autocatalytic biosphere. A key concept is the driving of terrestrial life as a parametric oscillation: i.e. that the biosphere behaves fundamentally as an oscillatory system into which solar energy is diurnally deposited. The *schema*, containing 'A, B and C' type components acting together in a 'bottom-up' driving mechanism, underlies all biospheric superstructure. Surviving modes of the oscillation are consistent with Darwinian organization, or hierarchical structures appearing to have top-down propagation through the growth of cellular replication. The model was detailed by Budding et al (2012), where experimental support from the work of Powner et al (2009) is presented, as well as suggestions on supportive fossil evidence.

Although the growth in total energization is very slow in this model, it is important to notice its exponential character, suggestive of potential instability. The model is applicable to generally expectable processes on planets, including zonal segregation, complexity growth and Haeckel's biogenic principle within surviving life-forms. Fermi's exobiological paradox can be resolved in terms of the exponential growth and low *L* solutions of Drake's equation. Feasible values for the particular growth of selected species (the human one in the relevent terrestrial case) allow for *L* to be less than a few $\times$ 100 y, recalling Rees' (2004) 'final century' discussion. This arises when the species' disposable energization attains a value comparable to that of the total available daily driving energy. At that point, accidental, or stochastic disturbances of this species' energy ("error") can significantly disrupt the daily driving mechanism.