We present a planetary environment model (that) numerical simulations of biota-environment interactions in (that) life cannot be excluded when defining and calculating the property of a complex system involving the interaction of biotic and different planet if uninhabited

ORDERLINESS AND COMPETITION

BIOTA FEEDBACKS

We have tested our hypothesis using a population toy model, the Daisworld (DW). We applied a variant of the DW that incorporates the key role of the Hydrological Cycle (Hydrological Daisworld, HDW) (Salazar & Poveda, 2011).

In the HDW, an inhabited planet maintains habitable temperatures under a wider range of insolation conditions. Habitable equilibrium states are generally limit cycles rather than fixed points.

The “toy” model

Earth 1.5 is a simplified (albeit realistic) Global Environmental Model including two types of biota: forests (trees, t) and sabana-like areas (grass, g). The model implements the Dynamical Area Fraction formalism by Nordstrom et al. (2004). In contrast to a zero-dimensional model like DW, this model is 1.5-dimensional: fluxes area calculated along the atmospheric column and partially along longitude and latitude.

The effect of life on an Earth 1.5 is implemented using a “biotic regulation” algorithm that alters the evapotranspiration rate in response to environmental changes ONLY if (1) the growth rate is negative (first conditional) and (2) surface temperature deviates from its optimum value (second conditional).

The Habitable Zone of Inhabited Planets (InHZ)

The InHZ is the region (in space and time) where the complex interaction between life and its abiocic planetary environment is able to produce plausible equilibrium states with the necessary physical conditions for the existence and persistence of life itself.

TO KNOW MORE

