Geophysical Research Abstracts
Vol. 16, EGU2014-9992, 2014
EGU General Assembly 2014

Global Sensitivity Analysis of Indian Monsoon during the Pleistocene

Pablo Araya-Melo, Michel Crucifix, and Nabila Bounceur

Université Catholique de Louvain, George Lemaître Centre for Earth and Climate Research, Louvain la Neuve, Belgium (arayamelo.pablo@gmail.com)

Since the mid-seventies, it has been recognized that changes in Earth's orbital parameters play a significant role in the climate system. The Indian Monsoon is a major manifestation of a seasonal cycle in the tropical regions, which is known to be sensitive on astronomical forcing, CO_2 and sea-level, which varied through ice ages. General circulation models (GCM) were extensively used to study the sensitivity of the different Earth's climatic phenomena, including Indian Monsoon. However, the effects of astronomical forcing, together with CO_2 and level of glaciation are known to interact non-linearly. Therefore, to fully appreciate the combined effects of environmental factors require a large number of experiments.

In order to overcome this, we apply a strategy referred to as global sensitivity analysis. It relies on three steps: design and perform experiments; design, calibrate and validate a "meta-model", also known as an "emulator"; and then visualize and quantify the individual and combined actions of the different factors on the monsoon climates. The methodology is applied on the climate simulator HadCM3, with which more than 100 experiments were performed.

The presentation focuses on the Indian Summer Monsoon and its interannual variability.

The sensitivity of the response of the Indian Monsoon to variations to climate precession, obliquity and level of glaciation are quantified. Given the importance of interannual and intraseasonal variability to the predictability of the monsoon, the emulator method is also applied to variability indices. The implication of the understanding and analysis of paleoclimate records are discussed.