Geophysical Research Abstracts
Vol. 18, EGU2016-5920-2, 2016
EGU General Assembly 2016

The ICTP Regional System Model (RESM) to simulate the monsoon in the South Asia CORDEX domain

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South Asian climate is characterized mainly by the wet and dry dipole that divides the annual cycle in two seasons: the monsoon season and the dry season. The life and the economy of those regions is very much influenced by the climate variability and the monsoon variability therefore is crucial to understand the physical mechanism associated with them.
The spatial and temporal representation of the monsoons over the South Asian region is one of the main challenge of global and regional climate models principally because they fail to represent the SST (sea surface temperature) induced rainfall when forced with observed SST resulting in a poor representation of the monsoon cycle (Fu et al. 2002).
The coupling with the ocean is essential to be able to simulate the correct air-sea interaction; the results are in general much improved and the monsoon patterns and the time representation (like the onset for example) are closer to the observations (Fu et al. 2002; Fu et al. 2007; Ratnam et Al. 2008; Seo et Al. 2009).

Here we present a Regional Earth System Model (RESM) composed by a regional climate model RegCM4 (Giorgi et al, 2012) coupled with the regional oceanic model MITgcm (Marshall et al, 1997) and two hydrological model: ChyM (Cetemps Hydrological Model, Coppola et al, 2007) and HD model (Max-Planck's HD model; Hagemann and Du¨menil, 1998).

We simulate the Southern Asian Climate taking into account the whole hydrological cycle. Wind stress, water fluxes and heat fluxes are exchanged from the atmosphere to the ocean, SST are exchanged from ocean to the atmosphere and in order to conserve mass, the river discharge is calculated from the Hydrological model and sent to the ocean.
The main goal of this work is to evaluate the impacts of local air–sea interaction in the simulation of the interannual variability, over the Indian CORDEX (Giorgi et al, 2009) domain through regionally ocean–atmosphere-river coupled and uncoupled simulations, with a focus on monsoon season. The impact of a simplified low-resolution hydrological model (HD model) and the physical based high-resolution hydrological model (CHyM model) is also assessed in the fully coupled RESM simulations.

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