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Coupling of a Dynamic Biosphere Model and a Regional Climate Model

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IBIS, an integrated biosphere simulator, is designed to integrate a variety of terrestrial ecosystem phenomena within a single, physically consistent model that can describe the land surface process well. It is coupled to a parallel regional climate model- RegCM3 to investigate the interactions between land and atmosphere.

The whole coupling processes include 4 parts: initialization, two interfaces of RegCM3 and IBIS (one for passing variables from RegCM3 to IBIS, the other for passing variables from IBIS to RegCM3), setup restart, and modification of output. Imitating the coupling methods of BATs, the processes do not changes the original codes of RegCM3 and IBIS as possible as they can. One subroutine is used to join two models.

To assess the ability of the coupled model, three domains, the maritime continent, the U.S and East Asia, are chosen. A 15-year (1986-2000) simulation over the maritime continent shows that the model can reproduces the basic climatology over the region of interest. However, the model overestimates the precipitation over land and underestimates it over ocean, a 2-3 degrees warm bias can be found also over the land. Two 5-year (1986-1990) simulations over the U.S and East Asia are being down. The simulated precipitation and temperature show a good agreement with the observations in both winter and summer over above two regions. The main shortcoming of coupled model are: 1) The model overestimates the rainfall over the south-east parts of the U.S in JJA and shows a few $^{\circ}$ of warm bias over most regions of the U.S. 2) The model underestimates the rainfall over the south-east parts of China in DJF and overestimates it in JJA.

In general, IBIS has been successfully coupled to parallel RegCM3. The model reproduces the basic climatology over the regions of interest.