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Introducing the MIT Regional Climate Model (MRCM)

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During the last decade researchers at MIT have worked on improving the skill of Regional Climate Model version 3 (RegCM3) in simulating climate over different regions through the incorporation of new physical schemes or modification of original schemes. The MIT Regional Climate Model (MRCM) features several modifications over RegCM3 including coupling of Integrated Biosphere Simulator (IBIS), a new surface albedo assignment method, a new convective cloud and rainfall auto-conversion scheme, and a modified boundary layer height and cloud scheme. Here, we introduce the MRCM and briefly describe the major model modifications relative to RegCM3 and their impact on the model performance.

The most significant difference relative to the RegCM3 original configuration is coupling the Integrated Biosphere Simulator (IBIS) land-surface scheme (Winter et al., 2009). Based on the simulations using IBIS over the North America, the Maritime Continent, Southwest Asia and West Africa, we demonstrate that the use of IBIS as the land surface scheme results in better representation of surface energy and water budgets in comparison to BATS. Furthermore, the addition of a new irrigation scheme to IBIS makes it possible to investigate the effects of irrigation over any region. Also a new surface albedo assignment method used together with IBIS brings further improvement in simulations of surface radiation (Marcella and Eltahir, 2013).

Another important feature of the MRCM is the introduction of a new convective cloud and rainfall auto-conversion scheme (Gianotti and Eltahir, 2013). This modification brings more physical realism into an important component of the model, and succeeds in simulating convective-radiative feedback improving model performance across several radiation fields and rainfall characteristics.

Other features of MRCM such as the modified boundary layer height and cloud scheme, and the improvements in the dust emission and transport representations will be discussed.