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Earth system model to help monsoon projection on cards

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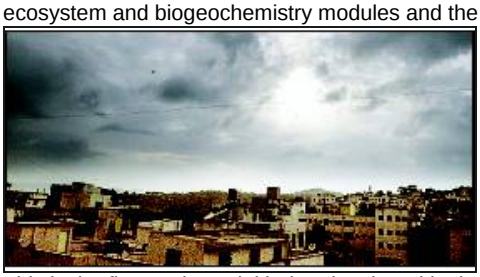
Pune: The Centre for Climate Change Research (CCCR) at the Indian Institute of Tropical Meteorology (IITM) here is developing an earth system model (ESM), which would help in generating projections of monsoon climate from seasonal, inter-annual, decadal, centennial and longer time-scales.

The ESM is required for addressing issues on attribution and projection of regional climate change. The simulations from the model can also be used to derive information on how regional climate changes will affect water resources, agriculture, health, etc. It is for the first time that such a model is being developed in the country. R Krishnan, executive director, CCCR, said: “Understanding climate change at regional levels involves major uncertainties. For example, quantifying the roles of natural and human-induced processes on the changes in the monsoon rainfall is quite a challenging issue. Making reliable projections of changes in the mean monsoon rainfall over India, say, in the next 30 years, involves major uncertainties arising from inadequate understanding of the complex feedback processes among the earth system components.” The development of ESM is an important effort towards understanding and improving the representation of feedback processes among the ESM components. “This will involve building software modules to realistically represent the physical and dynamic processes occurring within and among the different components (i.e. the atmosphere, ocean, cryosphere and the biosphere). For instance, anomalous surface temperatures in the ocean can affect rainfall distribution and global wind patterns, while the winds themselves can alter the sea surface temperature. Such type of ocean-atmosphere interaction occurs during the El Nino phenomenon. Likewise, in the biosphere, the plants absorb sunlight and carbon-dioxide, and thus can regulate the fluxes of heat, moisture and carbon-dioxide which have a direct impact on climate. So, when forests are cut down, it affects the climate system. All these processes would need to be reflected in the ESM,” Krishnan said.

The CCCR was set up by the ministry of earth sciences in 2009, primarily to address all scientific issues related to regional and global climate change and build capacity in earth system modelling. When these models are run for a hundred years or so, they can give an account of all these interactions. “There is some understanding about how these physical and dynamic processes happen. In the ESM, they have to be represented realistically through mathematical equations because you have to quantify those interactions. The ESM will involve massive computations and huge number crunching on high-performance computers,” Krishnan added.

The IITM already has an ‘atmosphere-ocean coupled model’ for its monsoon prediction research. The same model will be used for developing the ESM. “For this, different ESM components affecting climate system will be added into the atmosphere-ocean coupled model — such as the ecosystem and biogeochemistry modules and the aerosol transport module,” Krishnan added.



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