Ministry of Earth Sciences

Government of India

PRESS RELEASE

Observational Campaign to study small-scale processes and large-scale monsoon variability under a Joint Indo-UK effort

Ministry of Earth Sciences (MoES) launched the **National Monsoon Mission** program in 2012 with an aim to improve monsoon prediction at all temporal and spatial scales through joint efforts of national and international scientific communities. There has been considerable progress in modelling monsoon and its predictions, short term forecasts have improved, however, errors increase with time quickly. One of the causes is processes operating at small scales, but having major effect on the large-scale variability of the monsoon. There is paucity of quality data on them under monsoonal conditions. Improved understanding of the smaller scale physical processes will help in improving the computer simulation models, parameterization of physical process, which in turn will produce improved monsoon prediction.

To address the issue of better understanding of processes that drive the variability, and predictability of the South Asian Monsoon, India and United Kingdom have embarked on an ambitious plan to carry out a major joint observational campaign involving the deployment of UK's BAe-146-301 atmospheric research aircraft with sophisticated scientific instruments and India's Sindhu Sadhna research ship during the period May-July 2016. The UK's instrumented aircraft is a special aircraft which can fly at a very low-level for taking the observations. The aircraft observations will be augmented by special observational programs over the land using boundary layer flux towers, radars, additional radiosonde ascents, Microwave Radiometers, etc.

This joint effort is part of the implementation agreement signed between MoES and Natural Environment Research Council (NERC), UK on "***Predicting the Variability of the South Asian Monsoon****"* under the existing MoU between MoES and UK on Collaboration in

Earth System Science. Three research projects involving the Indian and UK scientists will study different aspects of physical processes affecting the monsoon.

The project "South West Asian Aerosol - Monsoon Interactions (SWAAMI)", involves measurements of aerosols across northern India and the Bay of Bengal during the pre-monsoon which will then be synthesized with long term measurements from ground based networks and data from previous intensive campaigns. The study is expected to characterize the mechanisms by which aerosols influence the Indian monsoon. The project "Interaction of Convective Organization and Monsoon Precipitation, Atmosphere, Surface and Sea (INCOMPASS) aims to capture the key surface-atmosphere feedback processes in models. Detailed observations on fluxes across land atmosphere interface are being made at eight stations covering different climatic regimes across India and these data will be compared with model predicted fluxes. The understanding gained from this study will improve the skill of rainfall prediction in operational weather and climate models by way of better understanding and representation of interactions between the land surface, boundary layer, convection, the large-scale environment and monsoon variability on a range of scales. The aim of "BoBBLE: Bay of Bengal Boundary Layer Experiment" is to determine, quantify and model ocean-atmosphere interactions that drive variability in the South Asian monsoon. Under this project, an observational campaign will be undertaken in the Bay of Bengal during June-July 2016 along with the analysis of wider observational and reanalysis-based data sets, and a set of hierarchical modelling experiments. The study will improve the understanding about the role of thermodynamic surface and mixed layer processes in the monsoon as well as the role of large-scale ocean structure, ocean dynamics and ocean biogeochemistry in the monsoon.

The aircraft observational campaign started on 8th June 2016 and will last till mid July.

Already the SWAAMI and INCOMPASS aircraft flying campaign has observed important mechanisms whereby small-scale changes at the land surface can set the scene for the establishment of monsoon storms, as well as in the variation of the lower atmosphere " the so-called boundary layer" across the Western Ghats mountains and the Arabian Sea interact with the monsoon winds. By scrutinizing our forecast models with these new observations, we will be able to produce better predictions of the monsoon. Meanwhile, important observations of dust and atmospheric pollutants have been made at the four corners of India. By examining the impacts of these particles on solar radiation, we will be able to determine the effect on development of monsoon clouds as well as the implications for air quality.