



## **The INCOMPASS project field and modelling campaign: Interaction of Convective Organization and Monsoon Precipitation, Atmosphere, Surface and Sea**

Andrew Turner (1), Ganapati Bhat (2), Jonathan Evans (3), Ranju Madan (4), John Marsham (5), Gill Martin (6), Ashis Mitra (7), Gm Mrudula (8), Douglas Parker (5), Sandeep Pattnaik (9), En Rajagopal (7), Christopher Taylor (3), Sachchida Tripathi (10), and the INCOMPASS Project Team

(1) University of Reading, NCAS-Climate/Department of Meteorology, Reading, United Kingdom (a.g.turner@reading.ac.uk), (2) Indian Institute of Science, Bengaluru, India, (3) Centre for Ecology & Hydrology, Wallingford, United Kingdom, (4) India Meteorology Department, Delhi, India, (5) University of Leeds, School of Earth & Environment, Leeds, United Kingdom, (6) Met Office Hadley Centre, Exeter, United Kingdom, (7) National Centre for Medium Range Weather Forecasting, Noida, India, (8) CSIR-National Aeronautic Laboratory, Bengaluru, India, (9) Indian Institute of Technology-Bhubaneswar, Bhubaneswar, India, (10) Indian Institute of Technology-Kanpur, Kanpur, India

The INCOMPASS project uses data from a field and aircraft measurement campaign during the 2016 monsoon onset to better understand and predict monsoon rainfall. The monsoon supplies the majority of water in South Asia, however modelling and forecasting the monsoon from days to the season ahead is limited by large model errors that develop quickly. Likely problems lie in physical parametrizations such as convection, the boundary layer and land surface. At the same time, lack of detailed observations prevents more thorough understanding of monsoon circulation and its interaction with the land surface; a process governed by boundary layer and convective cloud dynamics.

From May to July 2016, INCOMPASS used a modified BAe-146 jet aircraft operated by the UK Facility for Airborne Atmospheric Measurements (FAAM), for the first project of this scale in India. The India and UK team flew around 100 hours of science sorties from bases in northern and southern India. Flights from Lucknow in the northern plains took measurements to the west and southeast to allow sampling of the complete contrast from dry desert air to the humid environment over the north Bay of Bengal. These routes were repeated in the pre-monsoon and monsoon phases, measuring contrasting surface and boundary layer structures. In addition, flights from the southern base in Bengaluru measured contrasts from the Arabian Sea, across the intense rains of the Western Ghats mountains, over the rain shadow in southeast India and over the southern Bay of Bengal. Flight planning was performed with the aid of forecasts from a new UK Met Office 4km limited area model.

INCOMPASS also installed a network of surface flux towers, as well as operating a cloud-base ceilometer and performing intensive radiosonde launches from a supersite in Kanpur.

Here we will outline preliminary results from the field campaign including new observations of the surface, boundary layer structure and atmospheric profiles from aircraft data.

We also include initial results from nested high-resolution modelling experiments of the 2016 monsoon, at a resolution of 4km in comparison with bespoke regional forecasts run throughout the field campaign.