Geophysical Research Abstracts
Vol. 19, EGU2017-16360, 2017
EGU General Assembly 2017
© Author(s) 2017. CC Attribution 3.0 License.

Aircraft Observations of Soil Hydrological Influence on the Atmosphere in Northern India

Christopher M. Taylor (1), Emma J. Barton (1), Danijel Belusic (2), Steven J. Böing (3), Kieran M. R. Hunt (4), Ashis K. Mitra (5), Douglas J. Parker (3), and Andrew G. Turner (4)

(1) Centre for Ecology and Hydrology, Wallingford, Oxon, United Kingdom (cmt@ceh.ac.uk), (2) Swedish Meteorological and Hydrological Institute, Norrkoping, Sweden, (3) School of Earth and Environment, University of Leeds, UK, (4) Department of Meteorology, University of Reading, Reading, UK, (5) National Centre for Medium Range Weather Forecasting, Noida, Uttar Pradesh, India

India is considered to be a region of the world where the influence of land surface fluxes of sensible and latent heat play an important role in regional weather and climate. Indian rainfall simulations in GCMs are known to be particularly sensitive to soil moisture. However, in a monsoon region where seasonal convective rainfall dominates, it is a big challenge for GCMs to capture, on the one hand, a realistic depiction of surface fluxes during wetting up and drying down at seasonal and sub-seasonal scales, and on the other, the sensitivity of convective rainfall and regional circulations to space-time fluctuations in land surface fluxes. On top of this, most GCMs and operational atmospheric forecast models don't explicitly consider irrigation. In the Indo-Gangetic plains of the Indian sub-continent, irrigated agriculture has become the dominant land use. Irrigation suppresses temporal flux variability for much of the year, and at the same time enhances spatial heterogeneity.

One of the key objectives of the Anglo-Indian Interaction of Convective Organization and Monsoon Precipitation, Atmosphere, Surface and Sea (INCOMPASS) collaborative project is to better understand the coupling between the land surface and the Indian summer monsoon, and build this understanding into improved prediction of rainfall on multiple time and space scales. During June and July 2016, a series of research flights was performed across the sub-continent using the NERC/Met Office BAe146 aircraft. Here we will present results for a case study from a flight on 30th June which sampled the Planetary Boundary Layer (PBL) on a 700 km low level transect, from the semi-arid region of Rajasthan eastwards into the extensively irrigated state of Uttar Pradesh. As well as crossing different land uses, the flight also sampled mesoscale regions with contrasting recent rainfall conditions. Here we will show how variations in surface hydrology, driven by both irrigation and rainfall, influence the temperature, humidity and winds in the PBL. These unique observations will provide a powerful tool for understanding the dominant land-atmosphere coupling mechanisms operating on a range of multiple length scales, and which help to shape the Indian monsoon.