More accurate prediction of scale and impact of weather events

May 1 2020

Credit: University of East Anglia

Large-scale weather events, such as monsoons and tropical cyclones, can now be more accurately predicted, findings from a joint India-UK research project show.

Using a research vessel in the southern Bay of Bengal, the teams from the Indian Institute of Science, Bengaluru, the University of East Anglia (UEA) in the UK, and several Indian institutions have created a blueprint

for future weather system observational experiments, critical for forecasting things such as rainfall amounts. This could mean, for example, that Asian farmers are able to determine the optimal time for planting crops and what will grow best based on expected levels of rainfall.

The research project was led by Prof P. N. Vinayachandran, of the Centre for Atmospheric and Oceanic Sciences at the Indian Institute of Science, Bangalore, and Prof Adrian Matthews, of the Centre for Ocean and Atmospheric Sciences in UEA's School of Environmental Sciences and School of Mathematics. The findings, 'Closing the sea surface mixed layer temperature budget from in situ observations alone: operation Advection during BoBBLE', are published in *Nature Scientific Reports*. The project was jointly funded by the Ministry of Earth Sciences, Government of India, and the Natural Environment Research Council (NERC), UK.

The project also included researchers from Cochin University of Science and Technology, Kochi, India; the CSIR-National Institute of Oceanography, Goa & Visakhapatnam, India; the Indian National Centre for Ocean Information Services, Ministry of Earth Sciences, Govt. of India, Hyderabad.

Time series of oceanographic properties, including temperature, salinity, velocity, underwater radiation and subsurface mixing, along with surface fluxes of heat, were calculated from shipboard measurements on board the RV Sindhu Sadhana in the southern Bay of Bengal during the boreal summer monsoon of 2016. The measurements were made continuously for 11 days, using a novel combination of ship-based and autonomous platforms, such as ocean gliders.

Prof Matthews, professor of meteorology, is the UK lead on the overall project, the Bay of Bengal Boundary Layer Experiment (BoBBLE).

Prof. P. N. Vinayachandran, professor of oceanography, Indian Institute of Science, is the India lead of BoBBLE and the leader of the expedition on board ORV Sindhu Sadhana.

Profs. Matthews and Vinayachandran said: "Cloud formation in the monsoon regions is crucially dependent on the temperature of the ocean beneath. Therefore, accurate determination of the sea surface temperature in models is absolutely essential.

"The sea surface temperature (SST) is a fundamental driver of tropical weather systems. But there is a lack of understanding of the factors that control SST variability, especially during the monsoon.

"Forecasting monsoon rainfall requires accurate simulation of the SST, and inadequate information may also hinder predictions of climate change on monsoon rainfall.

"Variability in tropical SST in turn influences large-scale ocean-atmosphere interaction processes such as the Asian monsoon, El Niño, tropical cyclones and expansion of sea ice in the Antarctic.

"The study in the Bay of Bengal serves as a blueprint for future observational campaigns that aim to determine the scale and impact of weather systems."

The findings, 'Closing the sea surface mixed layer temperature budget from in situ observations alone: operation Advection during BoBBLE', were published on April 27, 2020 in *Nature Scientific Reports*.

More information: V. Vijith et al. Closing the sea surface mixed layer temperature budget from in situ observations alone: Operation Advection during BoBBLE, *Scientific Reports* (2020). DOI: 10.1038/s41598-020-63320-0

Provided by University of East Anglia