



Joint projects Incompass study of factors affecting India's monsoon



RAIN CLOUDS: The Faam research aircraft; and (right) Andy Wilson from the Met Office with Dr Harsh Vardhan, India's minister of science and technology and earth sciences

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BRITISH and Indian scientists have collaborated as part of an ambitious £8 million joint project to gain a greater understanding of the southern Asian monsoon and its effects on the world's climate.

One such initiative called Incompass, part of a large-scale observational campaign, saw UK and Indian scientists use a state-of-the-art research aircraft in the past two months to take atmospheric measurements of the summer monsoon.

Dr Andrew Turner, from the University of Reading, led the Incompass project in May and June in India. He spoke to *Eastern Eye* about the work his team did with their Indian counterparts.

"In Incompass, we were particularly interested in how the structure of the atmosphere, and the clouds within it, change in response to changes at the [earth's] surface. The observations collected will help us to better understand why there are errors in our weather and climate forecast models for the monsoon, and eventually lead to better models," said Dr Turner.

His 10-member team used a special Faam research aircraft, which can carry up to 20 people and instruments, from the UK's Natural Environment Research Council (NERC), for their work. Scientists from UK universities, the centre for Ecology and Hydrology and the Met Office flew research flights for 25 days, from their base in Lucknow in Uttar Pradesh state in the northern plains, the Ganges basin region of India and from an airport in Bangalore in the south.

More than half of India's farmers lack irrigation for their crops, which means they are almost entirely dependent on the annual rains that fall in intense bursts from June until September.

The effects of the monsoon play a vital role in shaping India's economy. The GDP growth, food prices, consumer spending and interest rates are all sectors that can be influenced by the rains. After an above-normal monsoon, the country's GDP can rise to eight per cent, with substantial benefits to the economy.

However, evidence from the past 25 years suggests that the Indian monsoon is growing less stable. Signs are tentative, and predicting monsoon behaviour is difficult. Previously a lack of devices for recording and sharing data has hampered scientists' work.

More precise predictions of the monsoon, which sweeps up from the Indian Ocean, can also

help hundreds of millions better prepare for droughts and floods.

A lecturer of monsoon systems at Reading, Dr Turner explained how they were able to fly at sometimes low levels in India. One of the things they were particularly interested in was the contrasting surface conditions across the country, how these affect the atmosphere above it, and therefore the development of monsoon storms.

"To the west [starting from northern India in Lucknow], we were able to fly to Jaipur and Jodhpur and beyond. This moved us out of the fertile Ganges basin and towards much drier regions that receive less rainfall. There is irrigation to support farming, of course, and in the drier regions, this often comes from groundwater that is pumped to the surface from aquifers. But the more one gets towards Jodhpur and beyond, one approaches the desert regions and agriculture is much reduced," said Dr Turner.

The Incompass project is among a number of ongoing UK-India science and research collaborations involving UK universities and Indian scientists. Incompass was able to interact with the BoBBLE project which saw scientists from the University of East Anglia (UEA) release special underwater robots from the Indian research ship, *Sindu Sadhana*, to study how ocean processes influence monsoon rainfall.

"We were lucky enough to get the chance to overfly the BoBBLE ship. It was a great opportunity to take measurements at the same time for different levels in the atmosphere from the aircraft and they could measure ocean currents," said Dr Turner.

Ben Webster, a researcher from UEA, said about the BoBBLE project: "We have already seen some interesting oceanographic features, including the very strong temperature contrast between the surface and deep ocean, some large internal waves travelling deep beneath the ocean surface and very rapid changes in salinity about 100 metres beneath the surface. Analysis of all of these features and their interaction with the weather conditions will be the subject of ongoing work."

Beamed backed to scientists via satellite signals, the research will be used to create computer models of the ocean to determine how it affects weather and rainfall over India.

India's meteorology office is also reportedly spending millions of dollars on a new super computer to predict how the monsoon is likely to develop each year.