

The Indian monsoon and climate change

Walker Institute research

Living in the shadow of the Asian monsoon

The monsoon across India, China and the rest of Southeast Asia affects the lives of more than one third of the world's population.

The Asian monsoon, like its counterparts in West Africa and Australia, is characterized by remarkable seasonal changes in wind direction and is associated with heavy rainfall during the summer months.

How might the monsoon change in the future? Will it continue to exist in its present form and if so, will floods or droughts be more common?

India's dependence on the monsoon rains

The monsoon rains provide nearly 80% of the year's rainfall in India, making it critical for agriculture, for drinking water and for industry which often relies on hydroelectricity for power. So India's economy and society are finely tuned to the remarkable stability of the monsoon, and vulnerability to small changes in monsoon rainfall is very high. In 2002 a severe and unforeseen drought hit India's agricultural production and economy hard. In August 2005 Mumbai experienced severe flooding, when more than one metre of rain fell in a single day.

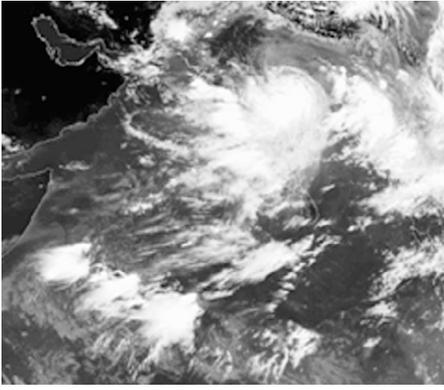
These variations in seasonal rainfall are often related to weather in other parts of the world, such as El Niño events in the Pacific Ocean. Understanding the timing, duration and intensity of the monsoon is vital if we are to predict these periods of drought and flood.

Advancing the science of monsoon prediction

Given the importance of the Indian monsoon for the livelihood of so many people, predictions about its stability and future behaviour are crucial. There is a pressing need to advance the science of monsoon prediction and its applications, as a crucial step in developing usable scenarios for assessing the socio-economic consequences of climate variability and change.

Using state of the art climate models and observations, our researchers are investigating the processes that control the monsoon rains and its variability. This work is helping to understand how and why the monsoon rains have varied in the past and how they might change in the future.





Monsoon clouds gathering over the Indian Ocean. The detailed processes that affect local and day to day weather over India are difficult for climate models to capture.

Credit: CIMSS, University of Wisconsin-Madison, USA

Delivering better climate information

Understanding how and why the monsoon varies

Developing capability to simulate the monsoon in climate models

Achieving skillful monthly and seasonal forecasts

Providing more confident projections of future climate change

Exploring impacts on food and water

How will climate change affect the stability of the Indian monsoon?

Climate models suggest that Asia's summer monsoon will persist. Indeed, the average summer rainfall may increase by around five percent, increasing water available for crop production, power generation and industry.

However, climate models also suggest greater variability in monsoon rainfall from year to year in a warmer world. So there could be greater range between flood and drought conditions, both of which could be more severe.

The Indian summer climate in the coming century looks to be wetter on average, together with flood and drought conditions occurring more often. What we still need to answer is how the daily patterns of weather, such as levels of heavy precipitation or active-break events, may change in future monsoon seasons.

We do not yet have a full understanding of the processes going on, and we know that climate models perform poorly in this critical yet challenging region where the ocean, atmosphere, lowlands and mountains all interact.

Our research is looking at these aspects and aims to deliver better climate information on the Indian monsoon.

Science into action

In the future, the pressures of an increasing population will bring additional stresses on society and the environment, with serious implications for water resources, health and food security. So, the possibility that the monsoon may become less stable as a result of climate change has serious consequences for India.

Our research will also help to explore the effects of changes in monsoon behaviour on food production, water cycle and eco-system functioning, and extreme events and health in India.

i For more information, please contact:

Kathy Maskell

Walker Institute
Communications Manager
University of Reading
Agriculture Building
Earley Gate
Reading RG6 6AR, UK

k.maskell@reading.ac.uk
Tel +44 (0)118 378 7380

www.walker-institute.ac.uk

© University of Reading 2013

This work is led by:

Dr Andy Turner

National Centre for Atmospheric Science – Climate Directorate
and Department of Meteorology

a.g.turner@reading.ac.uk