

# 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 societal infrastructures 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 rainfall 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 cru-

cial step in developing usable scenarios for assessing the socio-economic consequences of climate variability and change.



## 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.

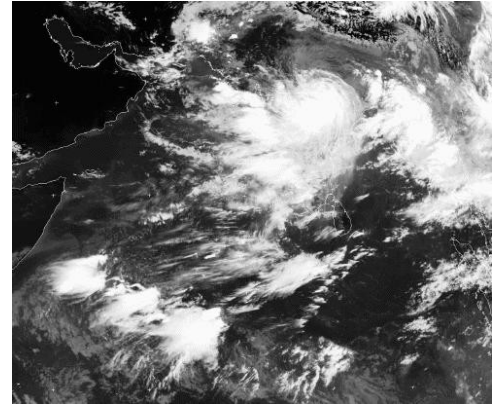
However, climate models also suggest greater variability in monsoon rainfall from year to year in a warmer world. So there could be greater range between flood and drought conditions, both of which could be more severe.

So, 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.



Active monsoon: 30 June 2007

## 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 ecosystem functioning, and extreme events and health in India.



Mumbai floods:  
26 July 2005

### 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.

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