

# NOTES AND NEWS

## The Notoriously Unpredictable Monsoon

The Indian Monsoon and by extension the Asian Monsoon which impact about 4 billion people (70% of world's humanity) today is perhaps the most complex feature of the earth's climate system and climate models have achieved only a limited success so far in simulating many features of this complex system.

Normally the Indian monsoon arrives at the southern tip of Indian Peninsula (about 8N) by May 25 and by June 7/8 the Monsoon' onset begins over Mumbai (largest Indian city, pop:~20 M) and it progresses further into central India and by June 25th to June 30th the Monsoon generally spreads over most of India. Despite year-to-year variations in these dates, the onset dates over a 150-yr database (one of the best datasets) shows Monsoon arrival dates remarkably robust. Delay in Monsoon arrival is often associated with anxiety about water shortage, impact on agriculture and of course an increased hype about "global warming, climate change and possible adverse impact". A careful examination of past data, however, shows such 'fears' about adverse global warming impact are without any merit.

Despite significant advances in Monsoon meteorology, predicting onset and overall intensity and distribution of Monsoon rainfall during the four summer months (June-September) is still a daunting task and considerable research efforts are needed at present to improve predictability of Indian/Asian Monsoon. Since the Indian/Asian Monsoon system transfers sufficient energy across the entire climate system, any future projection of earth's climate must include an improved modelling of the Monsoon system than what is available at present.

This year's Monsoon was predicted to be about normal (96% of normal) by the

IMD (India Met Dept) as early as April 18<sup>th</sup> and an early arrival (second week of May) of Monsoon rains at the southern tip of India suggested this year's Monsoon to be about two weeks early. However" further progress of Monsoon was stalled for reasons that we meteorologists do not fully understand and this stalling and later creating acute shortage of water in Mumbai and New Delhi (India's capital city with a pop, -14 M) has evoked comments like "Monsoon gamble, looming spectre of a drought etc" from many, including a scientist working with Greenpeace.

It must be remembered that such delays in Monsoon arrival have occurred in the past and has affected India's agricultural output, but such delays and irregular Monsoon progression are all part of natural variability, quite possibly linked to large-scale atmospheric circulation systems like the ENSO phase in Eq pacific, Eurasian and Himalayan winter snow cover, QBO (Quasi-Biennial Eq Stratospheric Wind Oscillation) phase and perhaps a host of other regional features. This is what makes the Indian/Asian Monsoon so very complex and a challenging scientific problem.

In 1972 the Indian Monsoon was delayed, especially in Peninsular India by almost six weeks and that year proved to be one of severest drought year for the Monsoon (most certainly this was attributed to the 1972 strong El Nino) which resulted in sharply reduced rice yield that year.

Earlier in 1961 Monsoon rains were heaviest during the four months with extensive flooding over many parts of India. Such floods and droughts have occurred irregularly and are still not fully understood. The worst ever drought was in 1877 which sparked an article (Proc of Royal Society) by Henry Blanford (British Met Reporter

for the then Govt of India) to speculate linkage between extensive snow cover over Himalayas during preceding winter and weak Monsoon.

Climate modellers almost 100 years later were able to simulate this inverse relationship. However much remains to be understood about how winter Eurasian snow cover impacts Monsoon circulation few months down the road and how the easterly Jet Stream that emanates from east of Bangkok to Saudi Arabia at about 12 km level over Peninsular India (during Monsoon months) evolves and influences Monsoon rains.

Per most recent IMD communication, Monsoon seems to be spreading over most of India (by June 30th) and this season's rains would be only about 93% of normal. The month of July is the most critical month with regular rains over most of eastern and western Gangetic Plains during normal Monsoon. Whether the Monsoon this year "behaves normally" for the rest of the season remains to be seen. The ENSO phase is about normal at this point in time, so NO adverse impact from Eq Pacific is expected. Winter snow cover was heavy during the, past winter, however the continued westerly phase of the QBO may help produce good rains over next few weeks.

Accurate Monsoon simulation and prediction with a lead time of few weeks to few months still remains an intractable problem for climate scientists.

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