



# INDIA'S MONSOONAL CLIMATE AND TIBET

Number 3 in a series of 10 briefings on climate and Tibet

AS LONG AGO AS 1884, AN English meteorologist working in India had the inspired idea that the snows of Tibet and the Indian monsoon are causally connected. Henry Francis Blanford, in the pages of Proceedings of the Royal Society, in London, proposed that the greater the snow cover in the land of snows –as Tibetans call Tibet- the later the Indian monsoon wets the parched earth on India. Conversely, he suggested, the less the winter snows in Tibet, the earlier the snowmelt, and the earlier the monsoon.

This brilliant intuition was unprovable at the time, in fact it took the entire 20th century and into the 21st century before evidence could be carefully assembled to demonstrate there is indeed a strong connection, just as Blanford supposed. Blanford, father of modern Indian meteorology, connected all available observations from the Himalayan hill stations of the Raj, noting the direct correlation between heavy winter snows and the failure, weakness or lateness of the following summer monsoon. He also noticed that when monsoons fail, the winter high pressure over India does not yield to a summer low.

Blanford was remarkably close to getting the bigger picture, of the snows not only on the Himalayan slopes but also beyond, across Tibet, and of the enormous low pressure covering Tibet in spring and summer, which draws the Indian monsoon in from the ocean, across India. Blanford had no access to Tibet, on the far side of the Himalayas. But now, China has set up 115 weather monitoring ground stations across the Tibetan Plateau, plus data available from satellites eyes in the sky, give us the full picture. Now, thanks to a NASA satellite, we have a torrent of downloadable data on the snows of Tibet (<http://nsidc.org/data/mod10a1.html> ).

The Terra satellite measurements show that when snow in winter, lingering on into spring, is unusually heavy across Tibet, not only does it delay the heating of rock bared by melting snow, it actually reflects much more of the sun's light and heat back into space. The delay in heating means delay in the formation of a huge centre of low pressure over Tibet in summer, so intense that it pulls air in to it, from as far as the Indian Ocean, laden with millions of tons of water. This is the monsoon, on which all life in India depends.

The monsoon in turn supplies Tibet itself with most of its rain, which falls as snow in the mountains, adding to the glaciers of the most glaciated part of the planet. Those slowly melting glaciers in their turn, feed the great rivers of Asia originating in Tibet. This is especially true of the Indus, Pakistan's life line, which relies mostly on glacier melt.

As early as the 1870s, Henry Blanford issued drought warnings to India, based on observations of Himalayan snow cover in winter and spring. Summer drought meant famine, giving urgency to his warnings.

He observed much seasonal variation from year to year in the depth and persistence of Himalayan snow, but today those variations from year to year are becoming more extreme, as the global climate warms and Tibet warms especially fast.

As the climate of Tibet becomes more extreme, so too does India experience alarming weather. The 2009 monsoon almost failed, coming far too late for many crops, especially in the densely populated northwest upper Gangetic plain and Punjab grain bowl. India's meteorologists say 2009 seasonal rainfall was 64% of its long-term average over Northwest India, and monthly rainfall was 53% of long-term average in June, a deficit of 47 per cent.

The extreme flooding of southern India late in the monsoon season, the long pause before the rains arrived at all in much of the north, are examples of the long term trend towards more extreme and unpredictable monsoons, as plotted by Indian scientists using data starting in the 1960s (Goswami 2006).

The danger, in the near future, is that such extremes can push the entire monsoon-generating system, including the snow cover of Tibet, past a crucial tipping point of no return, according to a team of scientists speaking at the British Met office conference on climate in Oxford, September 2009. According to Levermann and colleagues there may well be an abrupt transition to a new pattern of monsoon seasons in which, in some years, the monsoon will fail altogether, or be delayed by several months.

India needs Tibet to pull in the monsoon clouds from the Arabian sea, Indian ocean and Bay of Bengal. All of south Asia, from Pakistan, across India, Bangladesh and Burma rely directly on Tibet for the water in the great rivers, all of which rise in Tibet, and for the rain from the sky.

India has always known the Himalayas as abode of the gods and glacial source of pure waters. But even the realm of the gods can suffer from human interference. Tibet is no longer able to provide its environmental services as reliably as before, because the land, rivers and lakes of Tibet are degrading. Fifty years of intensive industrialisation and over-exploitation has desertified much of the grasslands, degrading pastures, altering the water-holding and heat absorbing capacities of the nomadic rangelands. Everywhere across Tibet lake levels are dropping, rivers are being dammed, often in massive cascade series as they drop from the Tibetan Plateau.

Scientists consistently report that Tibet is warming fast, getting less rain in summer, when crops most need it, and more rain in spring and also in autumn after the harvest is complete. Warming means early thawing of frozen earth permafrost, depriving Tibet's many wetlands of water which now drains away before plants, in spring, can reach down for it. The wetlands dry and die. The impacts of climate change in Tibet are multiple, and the climate extremes are more frequent.

India has much to offer China, in the process of rehabilitating Tibet's degraded rangelands. India's rich traditions of citizen mobilisation and participatory development enable farmers, nomads, conservationists and scientists to work together to remediate degraded lands. India has innumerable stories of bottom-up initiatives which work. China knows only top-down command strategies, which fence nomads out of their rangelands, coercing them to sell their cows for slaughter. The nomads now lead useless lives, settled in concrete blocks on the fringes of their ancestral rangelands, their traditional knowledge useless. It is in India's interests to help China find a better way to heal Tibet.

#### WANT TO KNOW MORE?

Henry F. Blanford; On the Connexion of the Himalaya Snowfall with Dry Winds and Seasons of Drought in India; Proceedings of the Royal Society of London, Vol. 37 (1884), pp. 3-22, downloadable from JSTOR database

Anders Levermann et al, Basic mechanism for abrupt monsoon transitions, Proceedings of the National Academy of Sciences, USA, 2009 10.1073/PNAS0901414106

B. N. Goswami, V. Venugopal, D. Sengupta, M. S. Madhusoodanan, and Prince K. Xavier; Increasing Trend of Extreme Rain Events Over India in a Warming Environment; Science 1 December 2006 314: 1442-1445

Environment and Development Desk  
DIIR, CTA, Dharamshala  
Tel (off): 01892-222510  
edd@gov.tibet.net  
www.tibet.net