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August 2012 cloudburst and subsequent flash flood in the Asi Ganga

On 3 August 2012, a cloud burst event on NE–SW trending Pandrasu ridge, that serves as a water divide between the Yamuna and Bhagirathi rivers brought a massive flash flood causing destruction and havoc downstream. Vikram Gupta *et al.* (page 249) report the destruction in the Bhagirathi Valley, especially in the Asi Ganga and Suwari Gad catchment region which witnessed deaths of 35 humans along with 436 livestock, affecting about 12,000 people and damaging property and infrastructure. Number of villages like



Agora, Kaldiya, Utro and Gangori located along the Asi Ganga River witnessed massive destruction. Discharge data during 2–5 August 2012 collected from the Maneri and Joshiwara Dam sites in Uttarkashi districts depict anomalous rise in water level in the river. It has been noted that there was an abrupt increase in discharge at Joshiwara in the early hours on 3 August 2012. This discharge returned to its normal in an hour. However, at 23:00 hours, the same day, the discharge rose to about 5 times, i.e. 3390 m³/sec cf. 662 m³/sec than the previous hour. The flood completely damaged three small hydropower projects (SHPs) namely, Asi Ganga-I, Asi Ganga-II and one in the Kalidi Gad that was

under construction in the Asi Ganga valley and several bridges, hotels and houses in both the Asi Ganga and Suwari Gad valleys. Cloud bursts are posing to be a common phenomenon in the Himalayan region, therefore early prediction and warning of such events have become a need of the day to avoid further loss of lives and property.

Vegetation decline due to invasive herbivores

Elephants and chital (spotted deer) have been recorded earlier as causing damage to the vegetation in the parts of the Andaman Islands where they have been introduced. Ali and Pelkey (page 209) have obtained satellite imageries for two time spans of 5 years each using different sensors, and found that the damage done was large enough to be show up in a time series analysis. An area with both species had higher degradation rates than areas with only deer, and this was in turn higher than areas with neither. The overall rate of vegetation loss in areas with deer seems high enough to make control measures both necessary and urgent. India is one of the few countries in the world without a proper invasive species policy.

Large Igneous Provinces

Magmatism associated with Large Igneous Provinces (LIPs) that cover tens of thousands of square kilometres represent large-scale mass and heat energy transfer from the Earth's deep interior to its surface affecting the lithosphere and atmosphere on which life is sustained. Origin and emplacement of LIPs is

thus a first-order research frontier that has profound implications for understanding Earth's mantle dynamics and its evolution, Earth's atmospheric fluctuations and climatic shifts, redistribution of land and oceans, biosphere involving migration of flora and fauna and mass extinctions, distribution of metal deposits, including source of hydrocarbons. A paradigm-shift is taking place in our understanding of the fundamental processes related to large-volume magma generation and mantle evolution leading to scientifically challenging new questions. S. Sensarma *et al.* (page 182) evaluate strengths and limitations of competing models for origin of LIPs (plume versus non-plume), and bring forward the vexed issues that are not readily explained by any of the contemporary models from global perspectives. They also discuss important research agenda pursuable in Indian igneous provinces (e.g. identification of new LIPs in the Precambrian, Fe-enrichment, fertility and thermal state of mantle below India, detailed study of lava stratigraphy and palaeomagnetism, assessment of duration of LIP activities irrespective of compositional variability) for future study. It is proposed that 'Deep Earth Study' deserves a major thrust in India, with development of a national programme, solely devoted to this cause and augment research on all aspects of LIPs including high quality data generation, which is essential to match global initiative and make tangible contributions. Identification of strong integrated groups and subgroups in different fields towards a better understanding of the dynamics and evolution of crust–mantle system in the Indian subcontinent is need of the hour.