# Severe Hailstorm in Nepal: Two case studies

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Two severe hailstorms that took place in Nepal during the pre-monsoon months of May are investigated in this study. One storm occurred close to midnight on May 3, 2001 at Thori, 215m asl, a small village on the border with India. Giant 1kg hailstones destroyed 800 dwellings, most of the villagers' livestock (over 500 oxen and goats) and 200 hectare of crops. The second storm occurred at Pokhara, 800m asl, in Central Nepal on May 18, 2005, during the middle of the afternoon. The storm lasted 15 to 20 minutes and produced 1kg hail stones that destroyed 1000 vehicles, crops, property and caused many injuries. During the pre-monsoon months in Nepal, severe thunder and hailstorms cause significant property and agricultural damage in addition to loss of life from lightening. Forecasting thunderstorm severity remains a challenge even in wealthy, developed countries that have modern meteorological data gathering infrastructure, such as Doppler Radar. This study attempts to isolate the specific and unique characteristics of the two hailstorms that not only might explain their severity, but also suggest forecasting techniques for future forecasting in Nepal. The primary data sources for this investigation included Infrared Satellite images, which illustrated the sequences of convective activity, and original archived ESRL India and China upper air data, which were used for synoptic and mesoscale analyses.
The Thori hailstorm had its origins in a topographically induced lee-side convergence area in the deserts of Pakistan on May 2, 2001, from where it propagated eastwards into India and evolved into an eastwards travelling Mesoscale Convective Complex reaching Thori near midnight on May 3. Atmospheric instability over the Gangetic Plains, fueled by a very active surface heat low, cold temperatures and dynamic lifting mechanisms aloft, created a synoptic and mesoscale environment capable of generating a dangerous thunderstorm. Thori is known for frequent, severe hailstorms, owing to moisture convergence caused by the nature of its surroundings; an abnormally ample supply of moisture resulted in giant 1kg hailstones near midnight on May 3.
At Pokhara, late afternoon thunderstorms often accompanied by hail, are an almost daily occurrence during May. The hailstorm severity at Pokhara on May 18 was the result of enhanced convection from a sudden intrusion of extremely cold air aloft, originating over the Tibetan Plateau, to the lee-side of the Annapurna Region.
This study calculated CAPE values exceeding 7000J/kg for both hailstorms resulting in intense updraft speeds capable of sustaining giant hail growth.

Keywords: CAPE, Lifting Index, hailstorm, radiosonde, geopotential height

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