Nowcasting of Severe Weather Events in the Gangetic West Bengal Region Using Doppler Weather Radar

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Thunderstorm, hailstorm and tornadoes are well known short term severe weather phenomena which sometimes turn in to natural hazard causing a lot of damage to property and human lives. These phenomena remain un-reported many times due to lack of observation and communication, however, Doppler Weather radar (DWR) observes all kinds of weather phenomena in the range of 300 km and therefore, no thunderstorm or hailstorm remains un-noticed. The ability to detect storms and other weather phenomena is perhaps one of the most valuable uses of radar. Severe storms and tornado warnings, cyclone observations, flood warnings and wind shear warnings are all based on radar and result in the saving of lives and property each year. After the invention of Doppler Weather Radar, a new revolutionary field has been emerged for research and intensive studies about severe weather phenomena. It estimates not only the intensity of the thunderstorms in terms of Reflectivity (Z) but also measures the radial component of the wind velocity (V) and spectrum width (W). Many useful products are derived from these base products and being utilized for intensive research in the analysis of thunderstorms. The derived velocity products like PPI, CAPPI, Max, VVP_2 and UWT_2 have been found very useful in the prediction of severe weather events. The identification of a Hailstorm and its prediction has been made possible using DWR generated three dimensional structure of the cloud. The product VVP_2 has been found very useful in understanding the genesis of thunderstorms and their expected movement. The vertical wind shear, upper air circulation over the station in the radius of 40-50 km may be very well established using VVP_2 product.

Many severe weather activities take place in the Gangetic West Bengal region during pre-monsoon period including thunderstorm, hailstorm and tornado. The activities of severe thunderstorms are initiated in the north-west sector of Kolkata and they travel hundreds of kilometers in the south easterly or easterly directions. These deadly thunderstorms which are sometimes associated with hailstorm and tornado are known as "Nor'westers". Analysis of some of these severe weather events occurred in this region have been discussed in this paper and it has been established that DWR has got the tremendous potential of nowcasting of such short lived but severe weather phenomena. The signatures of Tornado associated thunderstorm can also be well recognized using radial velocity and reflectivity products. A diagnostic study has also been performed by the author for a Tornado occurred on 31th March 2009 in Orissa (India) using reflectivity images and found that a funnel shaped structure was visible in the images before the

occurrence of a tornado. The time of radar observation was very much coincided with the reports in the newspaper for occurrence of the tornado over that area. This has also been confirmed that a careful observation of DWR derived images with a short interval may provide a lead time of about 30 minutes for the prediction of Tornado Genesis and a warning may be issued for its occurrence.