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First results of lightning and radar observations in Minas Gerais, Brazil

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At the end of 2011, a C-band Doppler weather radar with polarimetric capability was installed on a hill ca 50 km west of Belo Horizonte, capital of the State Minas Gerais, for monitoring, forecasting and warning of storms in this region, because it suffers from flooding problems, which have their natural origin exacerbated by anthropogenic actions. The TITAN (Thunderstorm Identification, Tracking, Analysis and Nowcasting) software was implemented for the preliminary processing of data collected by the C-band polarimetric Doppler radar from November 2013 onwards. Lightning data are available from the RINDAT lightning detection network. Belo Horizonte is situated in a hydrological basin, where heavy rains and subsequent flooding frequently occur during the annual rainy season. The radar observations will serve to compile a first radar meteorology of the region, as well to study the three-dimensional structure and behaviour of severe thunderstorms for a better understanding and nowcasting of severe events. In addition to the aforementioned study, presented in a separate paper, the research conducted in this sub-project will study the interaction between thunderstorm cells and the generation of C-G (cloud-ground) lightning strokes, which will add important information for Nowcasting. The TITAN visualization program CIDD had been adapted for the radar range of the C-band radar in Minas Gerais. Composite reflectivity fields are then displayed for each volume scan of 7 – 8 min duration, superimposed by the lightning strokes corresponding to the same time interval. Two case studies have been selected to demonstrate the relationship between stroke rates and the life cycle of thunderstorm cells. Strokes can also be separated into the more frequent negative and rarer positive strokes to facilitate their identification relative to the radar image. The first case presented here relates to a severe hailstorm, which occurred over the municipal area of Belo Horizonte, while the second case demonstrates a predominantly stratiform rain situation. Preliminary results from the first case (20 January 2014) have shown, that 6684 strokes were recorded within a range of 400 km of the radar during a 24-hour period, of which only 12,4% were positive. During the occurrence of the hailstorm over Belo Horizonte, only one positive stroke was generated by this particular storm complex.