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Rain/snow radar remote sensing with two X-band radars operating over an altitude gradient in the French Alps

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Operating weather radars in high-mountain regions faces the following well-known dilemma: (1) installing radar on top of mountains allows for the detection of severe summer convective events over 360° but may give poor QPE performance during a very significant part of the year when the 0°C isotherm is located below or close to the radar altitude; (2) installing radar at lower altitudes may lead to better QPE over sensitive areas such as cities located in valleys, but at the cost of reduced visibility and detection capability in other geographical sectors. We have the opportunity to study this question in detail in the region of Grenoble (an Alpine city of 500 000 inhabitants with an average altitude of 210 m asl) with a pair of X-band polarimetric weather radars operated respectively by Meteo-France on top of Mount Moucherotte (1920 m asl) and by IGE on the Grenoble Campus (213 m asl). The XPORT radar (IGE) performs a combination of PPIs at elevations of 3.5, 7.5, 15 and 25° complemented by two RHIs in the vertical plane passing by the two radar sites, in order to document the 4D precipitation variability within the Grenoble intermountain valley. In the proposed communication, preliminary results of this experiment (started in September 2016) will be presented with highlights on (1) the calibration of the two radar systems, (2) the characterization of the melting layer during significant precipitation events (>5mm/day) occurring in autumn, winter and spring; (3) the simulation of the relative effects of attenuation and non-uniform beam filling at X-band and (4) the possibility to use the mountain returns for quantifying the attenuation by the rain and the melting layer.