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Lidar measurements carried out during the 28 February 2013 lava fountain event at Mt. Etna, in Italy

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Mt. Etna, in Italy, is one of the most active volcanoes in the world. Since 2011, the New South East Crater produced lava fountains that formed eruption columns rising up to several kilometers above sea level and fine ash dispersed hundreds kilometers away from the central craters. One of these events occurred during the 28 February 2013. The volcanic plume was directed toward the E and reached, during the climax phase, an height greater than 9 km above sea level. Lidar measurements were performed immediately after the lava fountain activity by a new portable Raman scanning Lidar system that is operating in Catania since 2013. The Lidar is operated at the Serra La Nave station, only 7 km away far from the Etna summits, and, during the winter seasons, at the INAF-Astrophysical Observatory in Catania. The Lidar named AMPLE is a portable multiwavelength scanning lidar system with depolarization measurement capability, able to carry out high quality 3D map of particle optical and microphysical properties. The laser source is a doubled and tripled diode pumped Nd:YAG laser, with a repetition rate of 1KHz. The Lidar system detects the elastic Lidar returns at 355nm and the N2 Raman Lidar echoes at 386nm. Each signal is acquired with a raw spatial resolution varying from 30cm to 30m. Results of the measurements performed on 28 February 2013 show different layers: the first layer below 1.5 km corresponds to smaller not depolarizing particles of local origin while the layer up to 7 km, is related to volcanic ash coming from Etna. A discrimination between spherical and non-spherical particles in the volcanic plume is clear from the aerosol depolarization values in the atmospheric column interested by the volcanic plume. Some differences in the aerosol size and typology are also highlighted by the Lidar Ratio values. Lidar measurements presented here show new insights on the plume dynamics during Etna lava fountain events.