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The influence of wind field on ash dispersal and eruptive style of explosive eruptions

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The VOL-CALPUFF code has been developed with the aim of modelling the volcanic ash transport from the injection of the mixture into the atmosphere up to its deposition on the ground. VOL-CALPUFF derives from a code, named CALPUFF, widely used for air quality studies. Its structure allows the modelling of both the rising plume and atmospheric dispersion by independent approaches. In particular, the column is described by an Eulerian framework solving the "plume theory" equations, whereas the transport and dispersion of ash is treated in a Lagrangian way by tracking diffusing packets of mass called puffs. An important novel feature of VOL-CALPUFF is that both the rising plume and the dispersal phase are modelled taking into account the forcing of real 3-D meteorological conditions. The meteorological data (temperature, pressure, vertical and horizontal velocities, relative humidity, etc.), provided to VOLCALPUFF as input data file, are obtained by using the meteorological processor CALMET (a module of the CALPUFF System structure). This provides an analysis of the atmospheric wind field on the basis of mesoscale model outputs. The importance of using a reliable meteorological dataset comes from the clear evidence of its major effect on the dynamics of the process. For this reason, several meteorological datasets with different resolutions (either along vertical or horizontal) have been applied in simulating real explosive events occurred recently at Mt.Etna. A comparison between the various simulated dispersal patterns and deposits and the experimental data will be presented. In addition, the influence of the wind field on the plume tilting and eruptive style will be discussed.