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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Quantification of the depletion of ozone in the plume of Mount Etna" *by* L. Surl et al.

Anonymous Referee #1

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This manuscript presents results of experiments aiming to evaluate the ozone depletion in the volcanic plumes. Instrumentation used, experimental techniques and data processing are very well described. The experimental results are then explained by means of an 1D-Lagrangian model of O3-chemistry with acceptable accuracy for a such simplified model. The depletion of ozone in volcanic plumes is directly related with the photochemical transformation of the primary emitted hydrogen halides such as HCl, HBr, etc. into reactive halogen species (e.g. BrO, ClO, OClO). The mansuscript is very well structured and conclusions made are clear and convincing. I strongly recommend publishing this manuscript in the journal Atmospheric Chemistry and Physics.

I have just a few minor comments: (1) The experiments are performed with ground based instrumentation. The atmospheric depletion of SO2 in volcanic plumes is rela-

tively well estimated (c.f. cited in the manuscript McGonigle et al., 2004). It is known that SO2 also may react in atmosphere with volcanic ash and water vapour. I was unable to find investigation of interaction of SO2 with the ground surface (mainly covered by volcanic ash near Etna craters). As far as all experiments are performed with grounded plume I wonder if this may cause some underestimation of measured depletion rates. (2) It will be better to plot figure 1 in Cartesian coordinates (Easting and Northing with origin in one of the thee craters) instead in geographical coordinates or at least to present and additional scale in units of kilometres. (3) Explain in more detail errors bars in figures 3, 4, and 5. (4) There is ongoing discussion about increase of BrO/SO2 ratio at the edge of volcanic plumes. All cases when the instrumentation was at the verge of plume are excluded from the consideration in this manuscript. Some brief discussion of the obtained results about ozone depletion in this situation could be very helpful to understand BrO behaviour close to plume edge.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 23639, 2014.