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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Natural or anthropogenic? On the origin of atmospheric sulfate deposition in the Andes of southeastern Ecuador" *by* S. Makowski Giannoni et al.

Anonymous Referee #2

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The manuscript describes sources of sulfate deposition from five years of precipitation measurements at two mountain sites in south eastern Ecuador. The authors have brought together meteorological measurements, emissions estimates, and satellite data to compare to precipitation sulfate measurements in order to evaluate the impact of various S sources on remote mountain regions. This is a novel approach to a difficult problem; the identification of acidic inputs in sensitive remote alpine regions in Ecuador enhances the ability of researchers to apply similar techniques in mountain regions around the globe. Information on long-term changes in S inputs to remote alpine regions can be used to evaluate changes in anthropogenic versus natural emis-

sions which in turn can be used to inform policy decisions. The manuscript was a pleasure to read. It is well constructed and aside from a few minor errors, typos and small grammatical mistakes that are described below, it is well written. The authors have been thorough in their description and the interpretation of the data is well argued and reasonably supported. Sufficient information is provided on the types of analysis and the potential pitfalls associated with the various data sets. The tables and figures are clear and appropriate.

Specific suggestions:

Abstract: Line 11: been instead of being Line 14: conditions affects the origin. . .

Page 2: Line 8: effects were found to be more serious Line 10: only a few studies Line 31: contribute larger amounts

Page 3: Line 7: surveys in some (duplicate word) Line 11: local sources such as Line 12: deposition Line 19: were given special attention Page 4: Line 1: emissions as accurately as possible Line 6: to determine sulfate deposition Line 17: It is unclear what is meant by "anthropogenic replacement systems" here. Please clarify. Line 23: are only a few sources

Page 5: Line 14: define MS (meteorological stations?). This acronym is described in a figure caption but it should be spelled out the first time it is used in the text. Line 18 and throughout the manuscript from this point forward SO2 – the 2 needs to be a subscript. Line 24: and transport to the observation sites.

Page 7: Line 4: that fires and volcanic emissions

Page 8: Line 23: pH

Page 9: Line 13: Before proceeding with Line 20: highest precipitation and OP inputs Line 23: observation period at around Line 25: spell out what the acronym MAD means here. Line 26: both types of precipitation input

Page 10: Line 1: highly loaded rain and OP – specify what the rain and OP is loaded with – ions?, sulfate? Line 6: generally higher when Line 26: from not form Page 11: Line 8: and pass over the sources Line 12: using a cross-correlation Line 24: It is observed that Line 28: at this altitude Line 29: topographical locations

Page 12: Line 17: Besides this there Line 23: airstreams Line 24: dark grey bars. Line 25: Contrary to this, during wind conditions. . . (light grey) Note that the light and dark grey description doesn't match the graphic.

Page 13: Line 2: small rather than light Line 6: showed the same peak coincidences at el Tiro Line 8: contributes Line 11: small rather than light Line 12: are also higher than in rain here. Line 14: of the type of precipitation

Page 14: Line 3: loadings in factors 1, 2, 4 and 5? Is the lack of factor 1 here a typo? If not, explain. Line 25: sources did not play Line 26: substantial

Page 15: Line 1: north and Page 16: Line 1: is relatively low here.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 13869, 2014.