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## ***Interactive comment on “Water vapour variability in the high-latitude upper troposphere – Part 2: Impact of volcanic emissions” by C. E. Sioris et al.***

**Anonymous Referee #1**

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This paper makes a case that volcanic eruptions may significantly enhance the amount of water vapour in the lower stratosphere. They use measurements from the MEAS-TRO and ACE-FTS, both solar occultation instruments on the Canadian SCI SAT. They study the possible contributions from 3 volcanoes that erupted in 2010-2011. By correlating aerosol extinction measurements with water vapour measurements they conclude that the water source is from the volcano even though the measurements themselves occurred a few months after the eruption.

For the most part the analysis is straightforward and reasonable but there is an issue that also need to be acknowledged. Referring to the Schwartz et al. GRL, 40 2316-2321, doi:10.1002/grl.50421,2013 paper, it turns out that 2010 and 2011 were years where convective injection of water vapor was quite active and intense, produc-

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ing events as high as 18ppmv against a background value of 5ppmv. Even though the air may be aerosol enriched, by virtue of the two month or so time lag, it is possible if not probable, that the moisture in these air parcels could be enriched by convective events. I think this possibility should be acknowledged.

A water vapor enhancement signature should be evident shortly after an eruption, even if it is injected as ice on particulates because the stratosphere is of very low humidity and sublimation should occur rapidly. I appreciate, that occultation type instruments do not sample well enough to capture a plume early in the eruption cycle. Even instruments like MLS or MIPAS often miss plumes in their early stages, but it would be worth looking at their data to see if enhancements are seen as they should produce bigger signatures and contrasts against background amounts. A case in point being in the Discussion (page 25885, line 10) that Kasatochi produced little impact on stratospheric water. MLS did observe enhancements in H<sub>2</sub>O from this eruption (see Schwartz, 2013 for reference); hence, the other volcanoes should produce even bigger signatures near eruption if they are able to influence the stratospheric water vapour budget as claimed.

A last point, even the southern hemisphere is also affected by mid-latitude convection events like those in the north (usually occurring over Uruguay) but they are not as frequent or intense.

Minor correction, page 25875 line 14 should 2002 be 1992?

Page 25879 line 7-8, you talk about Austral summer and also July / August. This is Austral Spring.

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 25873, 2015.

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