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Interactive comment on "Methane and nitrous oxide fluxes from the tropical Andes" *by* Y. A. Teh et al.

Anonymous Referee #1

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The manuscript by Teh and co-authors presents a comprehensive dataset evolved from an intensive field study and a small lab-study. They measured soil trace gas fluxes of CH4 and N2O and important ancillary variables along an elevation gradient in the Manu National Park, Peru, in order to produce estimates of soil trace gas fluxes from this extremely heterogeneous region and their environmental controls. The number of field studies in tropical montane ecosystems measuring soil trace gas fluxes and their natural controls is very limited although tropical upland ecosystems play a fundamental role in the global cycling of nutrients and natural trace gas fluxes. Furthermore, source strength and distribution of various sources still have to be investigated more closely in these regions that are extremely difficult to access. The manuscript is well written and the results are an additional step to narrow down the uncertainty of soil trace gas dynamics in space and time in one of the most remote areas on earth.

I have only some minor comments:

- Title of the manuscript: I would suggest a different title of the manuscript. The present study was conducted along an elevation gradient in the Peruvian Andes. The tropical Andes is a huge and very heterogeneous mountain range and studies in Ecuador showed different patterns in soil trace gas dynamics. Hence, I disagree with such a general title and suggest the authors state more clearly the location of their study within the title (e.g. Methane and Nitrous Oxide Fluxes along an elevation gradient in the Peruvian Andes). Only future studies that will repeat similar gas flux measurements will allow us to make more general statements (or titles) about soil trace gas dynamics in the tropical Andes.

- The authors measured soil trace gas fluxes of CH4 and N2O. Hence, they should make clear that they are referring to soil trace gas fluxes (or soil-CH4 or soil-N2O) throughout the manuscript. In the light of recent literature that plants produce CH4 by an abiotic mechanism (Keppler et al. 2006), canopy and cryptic wetlands emit CH4 in Andean upland forests (Martinson et al. 2010) and living trees harbor CH4-emitting methanogenic Archaea (Covey et al. 2012), I would suggest the authors include these citations and discuss these recent findings more in detail or at least mention them, when discussing CH4 and N2O fluxes from natural tropical upland ecosystems in general (The citations are completely missing in the introduction and in the discussion chapter). The conclusive sentences on Page 17420, Line 23 to 17421 Line 4 are simply neglecting other important recent findings that also "... challenge long-standing assumptions from the literature that upland tropical ecosystems are only net atmospheric CH4 sinks...". In my opinion, trace gas fluxes from the soil are only a part of the whole story.

- P17390, L9-L11 and P17401, L9-L12: The authors emphasize that their study is preliminary and a basis for their further research. Wouldn't it then not be better to include one or two additional years of gas flux measurements or lab studies in order to confirm first-year measurement results?

- I would suggest to present information about soil types and soil characteristics at the different study sites and discuss how they may determine measured variables, such as WFPS, soil moisture and nitrogen availability etc. This is very valuable information for future studies focusing on soil biogeochemical cycles because soil type diversity is very huge in the tropical Andes.

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