

## ***Interactive comment on “Partitioning of reactive nitrogen ( $\text{NO}_y$ ) and dependence on meteorological conditions in the lower free troposphere” by C. Zellweger et al.***

### **Anonymous Referee #3**

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The paper presents measurements of reactive nitrogen species performed at the high-alpine research station Jungfraujoch.  $\text{NO}$ ,  $\text{NO}_2$ , PAN,  $\text{NO}_y$ ,  $\text{HNO}_3$  and  $\text{NO}_3^-$  measurements are presented for a two-year period. Meteorological filters are used to discriminate the acquired data set between disturbed and undisturbed free tropospheric conditions. In general the paper is well written and presents a valuable contribution to the distribution and seasonality of nitrogen oxides over Europe. To my knowledge it presents the first published results of ground  $\ddot{U}$  based measurements of reactive nitrogen partitioning over a longer time period in Europe and I recommend it for publication in ACP. However, there are some important points that should be clarified before:

I am not sure what the main focus of this paper is. If the authors just want to demon-

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strate the usefulness of meteorological filters for measurements on the Jungfraujoch the paper has some value. Or do the authors want to show that their measurements represent free tropospheric conditions that are representative for European background air (and this point would be by far much more interesting) they have to put more effort in this paper.

The authors claim that the presented data are the first data series on nitrogen oxides levels in the free troposphere over Central Europe. This statement is not appropriate and exaggerates the value of this data set. There are numerous aircraft measurements of nitrogen oxides species over Europe. Furthermore ground based stations like that one at the Hohenpeißenberg also have a record on nitrogen oxides measurements.

To support their claim, that their measurements represent undisturbed free tropospheric air they have to compare their data to data obtained during aircraft measurements. In their publication they do not even mention that numerous aircraft measurements have been performed over Central Europe in the last few years. They authors could for example compare their measurements with observations made from the UK C130 or the German DLR Falcon.

The authors compare their measurements with other ground based measurements performed at Tenerife and the USA. These comparisons are nice but not really helpful to show that their measurements represent typical free tropospheric air over Central Europe. The authors should compare their data with the observations performed at other stations in Europe (like the Hohenpeißenberg or others) or at least give good reasons why these measurements are not suitable for comparison.

The data obtained at the Jungfraujoch might be a valuable contribution for the overall nitrogen oxides distribution in the free troposphere over Europe but the authors have to prove this statement by comparing their data with other measurements. This would significantly improve this paper and might demonstrate the usefulness of this kind of data for monitoring European background air.

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The same is true for their discussion on air mass aging, seasonality and  $\text{NO}_y$  partitioning. The authors should compare these important parameters and findings, if possible, with other measurements performed in Europe.

The application of meteorological filters is quite sure an important tool to analyse data obtained at ground based stations. The paper shows the strong influence of different meteorological situations on the measurements performed at the Jungfraujoch. But it would be interesting to know where the air masses probed during Foehn, synoptical lifting and thermally induced vertical transport came from. What have been the source regions, is there a typical finger print for these regions?

The  $\text{HNO}_3$  concentration observed for undisturbed free tropospheric conditions seems to be rather low. Did the authors perform measurements (with an e.g. an  $\text{HNO}_3$  permeation device) to study the possible loss of  $\text{HNO}_3$  in their trace gas inlet an ambient conditions?

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