

Interactive comment on “Long-term in situ measurements of NO_x and NO_y at Jungfraujoch 1998–2009: time series analysis and evaluation” by S. Pandey Deolal et al.

Anonymous Referee #2

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General Comments:

The authors present the longest running record of NO_y measurements recorded in the free troposphere (10 year record at Jungfraujoch). The measurements are complemented by coincident measurement of NO_x, CO, and O₃ (which have been described elsewhere). The authors conclude that, in contrast to measurements made in more urban settings, closer to sea-level, the concentration of NO_y is not decreasing in time, but rather displays a maximum in 2003. Instrument performance is assessed through comparison with a second, separate NO_y detector with an externally mounted converter. Agreement between the two detection methods was shown to be within 10%.

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Finally, the authors comment an anomalous sampling event, where the inlet of one NO_y detector was buried in snow, suggesting that high levels of NO_x point toward the possible influence of snow photochemistry. While any 10yr time series is an impressive feat, several unanswered instrumental questions, and qualitative conclusions prevent the paper from being published in its current form.

1. Free Troposphere: It appears that there was no attempt to filter the data to remove the impact of either local pollution events or strong stratospheric influence. Is it possible to use concurrent measurements of O₃, CO, and H₂O to at the minimum comment on the possible role of stratospheric NO_y? Is NO_y and CO tightly correlated?

2. Diurnal (or rather diel) profile in NO_y: Does NO_y display a strong diel profile? In the free troposphere (unperturbed by local emissions of recent convective activity), I would expect NO_y to be relatively constant. This could be an indicator of the impact of local emissions.

3. Inlet characterization: It is hard to imagine high transmission of HNO₃ through 1m 3/16 ID PFA. Have the authors directly characterized the transmission efficiency of this inlet, through standard additions to the inlet tip? A comparison of NO_y between two instruments does not provide us any information on the transmission efficiency of HNO₃ or other sticky compounds, as the slope is weighted heavily by the high NO_y points that likely have higher NO_x/NO_y? What does a comparison of NO_z look like?

Does the 10C heating refer to 10C over ambient, or is the inlet temperature controlled to a constant 10C. In either case, I would suspect that HO₂NO₂ or CH₃O₂NO₂ may play an important role in the NO_y budget in these airmasses. Due their thermal instability, I suspect that they might be included in NO_x?

4. Utility of NO_x/NO_y measurement: The NO_x/NO_y measurement is a tremendously useful metric for the age of air in the free troposphere. It would be particularly interesting to investigate this parameter in more detail: i) is there a strong diel profile, ii) can PBL influenced airmasses be removed to investigate seasonal variation in NO_x/NO_y

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and the role of convection.

5. Snow photochemistry: Unless the section on snow photochemistry is used to discuss potential artifacts on the NO_y measurements, it reads as an aside and does not contribute to the paper. It is also unclear how the ETHZ inlet is buried in the snow? Is it submersed, or close to the snow? It is hard to imagine snow in the inlet if it is heated to 25C?

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 21835, 2011.

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