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Peroxy acetyl nitrate (PAN) at Jungfraujoch from different source regions

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PAN (Peroxyacetyl nitrate) is a reactive nitrogen species which is formed from NO_x and volatile organic compounds (VOC) by photochemistry. The life time of PAN is highly temperature dependent therefore, it acts as reservoir for NO_x in cold temperatures and playing key role in transporting nitrogen species and further, enhancing O_3 production during intercontinental transport [Hudman 2004, Zhang 2008]. In our study we present continuous PAN measurements from year 2009 to 2010 and campaign measurements of 2008 performed at high alpine observatory, Jungfraujoch (Switzerland, 3580 m asl). Prior to our measurements, continuous PAN measurements were performed at Jungfraujoch in 1997 -1998 by Zellweger et al. [2000] . Both these measurements indicate that PAN concentrations tend to be higher in spring and summer. We compared the PAN measurements and traced the origin of air masses by trajectory analysis for both these time periods to evaluate the contribution of different continental sources. Trajectories were calculated at European and hemispheric scale and attributed to different source regions.

20 day backward trajectories were calculated using Lagranto (Global model, with horizontal resolution 1^0 x1^0) to evaluate the contribution of long range transport from different continents. Based on the recent boundary layer contact, PAN measurements were attributed mainly to three source regions; Europe, Asia and North America. The results showed that contribution of Europe is dominant in all the season especially in spring and summer while contribution from North America and Asia become significant in the autumn and winter months.

Further, European continental sources were evaluated using COSMO (Consortium for Small-scale Modeling) model trajectories which covers European domain on a horizontal resolution of 7 km x 7 km. 3 days backward trajectories were calculated and analysis was extended to clustering of trajectories based on the boundary layer contact. Further, these trajectories were combined with measurements to attribute possible source regions. The results showed that the air masses coming from northerly advection including Germany and Po valley in the south contributes to the higher PAN concentrations which were found in spring seasons.

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