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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric Brown Clouds in the Himalayas: first two years of continuous observations at the Nepal-Climate Observatory at Pyramid (5079 m)" *by* P. Bonasoni et al.

Anonymous Referee #1

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The paper focuses on the contribution of regional scale and large scale pollutant transport to the Nepal-Climate Observatory at Pyramid. It first of all gives an overview over the problematic of brown clouds in the Himalayas, and describes the set of instrumentation that is used at the Pyramid site which is suitable to characterize the aerosol load ozone and black carbon and the contribution of the 'brown cloud' at the site. To characterize the transport phenomena a mixture of modelling, back trajectories and local measurements to characterize the regional advection in the valley wind system is necessary. To describe the brown cloud the parameters, ozone (as a secondary prod-

uct of biogenic and anthropogenic emissions) black carbon as a product of burning processes and the number of coarse particles (> 1 um) is used. Modelling is based on WRF simulations and LAGRANTO backtrajectories. The analyses are done on a seasonal basis comparing pre-monsoon, monsoon and winter conditions.

The paper is supposed to be part of the special issue “Atmospheric Brown Cloud in the Himalayas” ,the objective of this paper is to evaluate the influence of the Asian Brown Cloud on the Himalayan atmosphere composition.’. . . With the aim of providing basic information useful for other research activities conducted at NCO-P and presented in detail in the companion papers, the meteorological conditions at the station during the first two years of activity (March 2006–February 2008) are presented, identifying the seasonal transitions as a function of local weather regime and discussing the local and large-scale air-mass circulation that characterised the measurement site.

General comments:

The manuscript includes a comprehensive summary of the brown cloud problematic and according to the instrumentation list is based on a large experimental data base with instrumentation well suitable for the proposed research. However, most of the manuscript is based on model results analyses which are not supported by the appropriate observational data either on the brown cloud composition or the composition of the air masses encountered during other large scale advection processes. The different source regions of atmospheric compounds should have a different composition signature. The composition of the brown cloud is can be described for example using the optical effective aerosols plus the total number of aerosols to account for the high number of burning aerosols which are too small to interact directly with radiation but possibly carry a significant fraction of black carbon. As a proxy for the optical active particles the number of particles larger than 1 um is not sufficient. The instrument installed measures also the size distribution starting from 300 nm. This is approximately the lowest size of aerosols that are measurable with an optical light scattering instrument. The total number of particles above this diameter would be a better repre-

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sentation of the optically active particles. Also the total mass as PM2.5 or PM10 could be derived from this instrument. These numbers would be helpful to compare to other locations. The number of small (ultrafine) particles can be derived from the SMPS or the TSI3010 counter at the station. Additionally the manuscript mentions also an integrating nephelometer which gives more information about the intensity of the 'brown clouds'. Although in the instrument list none of these experimental data are used in the manuscript. The results of modelling and backtrajectories are given in Figures 6, 8 and 9 with a resolution that does not allow to identify most of the features described in the text.

The manuscript would benefit from a more detailed description of the advection processes especially for the regional scale processes linked to direct transport of brown cloud components to the site AND the corresponding typical levels of particle number, mass and optical properties and black carbon in by far more detail than it is presented currently as seasonally average values. The different advection patterns should be described with better graphic presentation. For example, the exchange of the air between the Ganges valley and the Tibetian plateau is invisible in Fig. 6. I would recomment also a graph of the valley contour along the transport pathway.

Finally an analysis of aerosol mass and black carbon mass, transported with the different advection systems depending on the season would be a good addition for the interpretation, which anthropogenic activities are responsible for the 'brown cloud' at the station.

As long as the main focus of the paper is based mainly on model analysis, title, abstract and introduction are not appropriate and should be modified to match the content.

The data presented in the figures are not always in agreement with the text (e.g. Fig5 c).

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