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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Continuous observations of synoptic-scale dust transport at the Nepal Climate Observatory-Pyramid (5079 m a.s.l.) in the Himalayas" *by* R. Duchi et al.

Anonymous Referee #2

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Review of "Continuous observations of synoptic-scale dust transport at the Nepal Climate Observatory-Pyramid (5079ma.s.l.) in the Himalayas" by Duchi et al.

This paper reports valuable observation data of aerosol size distributions and optical depth in the high-altitude Himalayas. Although the outcome of this effort is documented well, the authors do not give any information on what their new additional information is. Compared to several papers published by the authors, it is not clear what are newly reported in this paper. Given the below criticism, as a reviewer, I recommend "reject" for this paper as it stands now but highly recommend "resubmission" after significant addition of analysis and modification of manuscript. As a non-native speaker, this

manuscript also should be checked by the native speaker.

Major comments:

(1) The authors select coarse dust particle events from 2-yr OPC measurements, and then identified the sources/origins of dust aerosols based on the back-ward trajectory calculations. How well the back-ward trajectories explain the origin of wind-blown dust particles? The approach for dust source identification is very simple and has potentially not recommendable, without additional information. An interpretation of backward trajectory is not straightforward. For example, how we can distinguish the dust source regions if the air mass pass over NA-AP-LT or TAK-TP. In this paper, the back-ward trajectories on the horizontal plane (i.e., latitude and longitude plane) are provided in Fig. 4, but this reviewer strongly suggest to show the vertical plane along the transport route to see the vertical movement of air mass. In addition, the authors mention that the purpose of this paper is to evaluate and characterize the frequency and intensity of dust transport events and their influence on background atmospheric properties in the high Himalayas (L20-22 of P4233). However, I CAN NOT find the impact of dust aerosols on the background atmospheric properties in the high Himalayas in this paper. What the authors mean "background atmospheric properties" here?

(2) The logic for data analysis is not reasonable. The authors argue that only night-time OPC data were analyzed to minimize the effects of thermal valley wind circulation. But Cimel-derived AODs given in Table 3 are obtained in day-time observation (09:45). As the reviewer mentioned in the introduction, this reviewer strongly suggest analyzing and showing both day and night-time data to explain the impacts of dust aerosols on radiation budget and on snow-albedo effects in the high Himalayas. The mixing of long-range transported dust particles with locally-emitted dust/pollution aerosols is also an important fact. For example, how the author explain the SSA with about 0.85 during dust events. This value of 0.85 is still quite low compared to the previous dust studies.

(3) SSA derived from nephelometer and MAAP measurements is not enough to explain

the contribution of dust particles on light absorption, because aerosol scattering coefficient measured particles less than 2.5 um in diameter. What is the size-cut of MAAP measurements? Why the authors do not provide the SSA as well as Angstrom parameter data from AERONT Cimel? The authors also proof the consistency of data quality between AERONET level 2.0 and 1.5 (e.g., compare AOD and Angstrom parameter for the periods when both level 2.0 and 1.5 data are available).

(4) In Tables 2 and 3, it should be added that how many data are used for each categorized case. No information is given. In table 3, it will be greatly helpful if the authors provide aerosol volume size distributions retrieved from Cimel.

Minor comments (selected):

L17-20 of P4232: "mineral dust may strongly affect the balance of tropospheric O3 (a powerful regional greenhouse gas), thus having a further indirect effect on climate" $\rightarrow$ Please provide relevant reference(s).

L5 of P4236: The uncertainty of SSA at 700nm should be mentioned, although details are given in Marcq et al.

L11-13 of P4239: "Decesari et al. (2010) showed that PM10 samples collected during DTEs from LT and TP were characterized by enhanced calcium content (up to 487 μgm$-$3)" $\rightarrow$ The value of 487 μgm$-$3 is extremely higher than the values reported in this study (Table 1). More explanations are necessary.

Figure 4: The MODIS AOD images do not provide any meanings. Why the authors showed? In addition, what level of MODIS data is used here? MODIS Collection 5.1 data and or MISR AOD data are recommendable to see AOD over the bright surface area.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 4229, 2011.