

Object: Response to comments on “Aerosol mass and black carbon concentrations, two year-round observations at NCO-P (5079 m, Southern Himalayas)” now changed to “Aerosol mass and black carbon concentrations, a two year record at NCO-P (5079 m, Southern Himalayas)”  
by A. Marinoni et al.

Dear Editor,

Please find below the responses to the specific comments raised in the 2 reviews. We believe all comments have been addressed and we followed all suggested changes. Modifications as respect to the original manuscript are performed in the new version. We thank the referees for the useful comments and we hope the manuscript now meets ACP scientific standards for publication.

Sincerely,

Angela Marinoni

## **Anonymous Referee #2**

### **1. General comments:**

The paper attempts to address diurnal and seasonal variation of aerosol and black carbon concentration in the Nepalese Himalayas. After two years of observation (March 2006 – February 2008) at Nepal climate observatory (NCO-P, 5079msl) authors conclude that aerosol mass and black carbon concentration follow well defined seasonal and diurnal variation. The paper reveals that quantity of pollutants is highest during pre-monsoon season and it drops to its minimum level during monsoon season. Thermal wind system plays a vital role in diurnal variation of pollutants over the Himalayas. Although the authors compare the results across different location of the world, some previous research are missing which were carried out in the same area (e.g. shrestha et al 2000).

***The references of the previous works carried out in this area have been updated.***

As the measurement site is characterized by a rugged topography, one of the major uncertainties in the climate science, which significantly affects the measurements of the parameter. The paper does not include general description of the site and its geography (e.g. surrounding environment, nearest settlement, land use patterns etc: :). Bonasoni et al (2008) also does not explain the geography of the site.

***A well detailed description of the measurement site is reported by Bonasoni et al., 2010 (now online on ACPD and under review processes) that presents a general overview of all the papers of special issue “Atmospheric Brown Cloud in the Himalayas”. This paper refers to this article for the measurement site description.***

The term “brown cloud” is not defined. “Asian Brown cloud” is old-fashioned and it is replaced by “Atmospheric Brown Cloud”.

***A sentence defining the brown cloud has been added in the Introduction; Asian brown cloud was replaced with wording “atmospheric brown cloud” along the manuscript.***

### **2. Specific comments:**

Objectives of the research are not clearly described. Everything is mixed up together.

***Objectives are now indicated at the end of the Introduction:***

***With the presentation of an unique data set referring to aerosol mass and black carbon observations carried out in a crucial area that plays a key role in climate change, the main objectives of this paper are to present and discuss the principal factors influencing the aerosol variability, in order to provide important information for the characterization of tropospheric background conditions and precious input to improve the performance of climate and atmospheric chemistry models at different scales.***

In section 3.1.1 the authors reveal the results that 60% increase in rainfall during 2006 pre-monsoon season over the same period of 2007. I don't see strong relation with the research title and sub-title. The results do not accompanied with citation and/or data analysis as well.

***The information on the precipitations supports the hypothesis of the relationship between aerosol interannual variability (difference between year 2006 and 2007) and the TBO. Data cited are still not published, while a deeper analysis of data should been not to the point. However, in agreement also with referee 1, asking to short the paragraph, the sentence on the connection between the precipitation and aerosol load was effaced***

Although the paper confirms the 'Tropospheric Biennial Oscillation' hypothesis, activation of CCN and IN could have affected increase in rainfall as the authors mention that 2006 is more polluted than 2007.

***As said at the previous point the sentence was effaced, because not really essential in the discussion. Anyway, as discussed in Rosenfeld et al. (2008) the effects of aerosols on clouds and precipitations are complex and can have opposite sign: CCN augmentation can both suppress or enhance precipitation. Thus it is difficult to establish clear causal relationship between aerosols and precipitation, and the sign of precipitation change can result from CCN concentration range. However our hypothesis leaves this complex dependence out of consideration and considers the aerosol augmentation only due to limited removal from wet scavenging: aerosol behaviour is than limited to be a consequence of the precipitation pattern and not a factor driving it.***

Methodology is adopted from the paper which is currently under review process. In the section 3.3 'air-mass cluster classification' is originally formed by Bonasoni et al (2010) which is not published to date however, the same classification is used in this article. Many papers cited in this article is not published yet (e.g. Bonasoni et al (2010); Duch et al (2010); Sellegri et al (2010); Maroq et al (2010)).

***Bonasoni et al (2010); Sellegri et al (2010) are now under review process in ACP, already accepted and online available on ACPD; Marcq et al (2010) is now accepted on ACP, while Duchi et al (2010) is still in preparation. Anyway, following the authors guidelines, ACP accepts references such as under review, submitted and in preparation.***

3. Technical corrections:

Some citation is missing in the reference list e.g. Bonasoni et al (2008).

***This was added in the text***

Some typos:

Page 8384 line 23 'ad'

***This was deleted***

Page 8392 line 20 'average' is double

***This was changed***

Use same value of Black Carbon concentration (either '160' or '160.5') and standard deviation (either '296' or '296.1') in abstract and conclusion

***This was changed***

***Rosenfeld D, Lohmann U, Raga GB, O'Dowd CD, Kulmala M, Fuzzi S, Reissell A, Andreae MO. (2008) Flood or Drought: How Do Aerosols Affect Precipitation? Science 321 (5894), 1309 – 1313.***

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