Responses to Anonymous Referee #1

We greatly appreciated the reviewer for the insight comments and suggestions for improving the manuscript quality. Below, we have addressed your concerns and provided our point-by-point responses in blue.

General

This is an interesting study on 'trace elements', i.e., in my understanding metals, in aerosol particles sampled at Mt. Lushan in southern China in summer 2011 and spring 2012.

The measurements are interesting with regard to the implications of cloud processing and because the studied metals are tracers for a variety of sources.

The back trajectory and source contribution modelling in the papers shines light on the origin of different families of metals.

I wonder how it can be better evidenced that the aerosol particles sampled in Guniubei have really been cloud-processed? As of now, it seems that this is Obeservation based, in that if there was a cloud at Mt. Lushan, the sampled particles were assigned as 'cloud-processed'. Is there an objective way to flag samples that they must have been cloud-processed?

In field observation, it is very difficult to prove if the aerosol particles have been cloud-processed at once when there are no occurring clouds at the sampling site. However, we can hardly neglect the effect of cloud processing on particles during transport in the air on account of the widespread cloud covering about 60% of the earth surface. By far, the impacts of cloud processing on aerosols are mostly investigated by laboratory simulations. In this study, as mentioned in Section 3.4.4, we collected the aerosols for several hours immediately after the disappearance of the cloud and marked the samples as cloud-processed. In truth, the cloud events were fairly evident to be distinguished and the sampling intervals were short enough to minimize the outside interference to the cloud-processed aerosols. Real-time meteorology parameters such as wind speed (WS), relative humidity (RH) and visibility were additionally used to support the identification of cloud process. For instance, Figure R1-1 displays the ambient circumstances of non-precipitation cloud process on 18 April 2012 with averaged WS < 1.0 m s^{-1}, RH ≥ 99% and Visibility < 0.05 km (Table R1-1), adequately indicating the actual cloud-processing. Figure R1-2 (a) and (b) shows the typical circumstances of a developing/coming cloud and a disappearing/leaving cloud, presenting a much better Visibility > 2 km. Moreover, the cloud-processed particles were commonly found to exhibit a much thicker aqueous layer covering them through TEM analysis. All in all, we can well recognize and flag the cloud-processed samples by timely artificial observation of cloud events and experienced manual sampling of post-cloud particles with short time intervals.

Another detailed map of the orography of the site, i.e., the mountain, the sampling place and key meteorology parameters would also be of assistance to the reader. Maybe some supplementary material can be used for this.

It is a very considerate suggestion. We will add another more detailed topographical map of Mt. Lushan and the sampling site as the supplementary material. The key meteorology parameters such as temperature (T), relative humidity (RH), wide speed (WS) and Visibility are listed in Table R1-1 and will also be add into the supplement. Generally, it can be seen that the summer days exhibited higher temperature, RH and wind speed than spring. The relatively high RH were likely to be contributed by the frequent cloud and rainfall at Mt. Lushan. Obviously, the two selected typical cloud events were characterized by extremely high RH and much low wind speed along with a visibility of nearly 0 km during

Overall, this is a very nice and thoughtful contribution which merits publication in ACPD subject to minor revision.

Thank you very much!

Details

Page 13003, line 4: Atmospheric lifetime of particles should not be much beyond 10 days, cf Jaenicke (1978), pls reconsider the statement of ‘weeks’

We have deleted the statements of “weeks” with caution in the revised manuscript, as particles with sizes larger than 1 μm usually have short residence time in the troposphere.

Table R1-1. Key meteorology parameters (Mean ± SD) during summer of 2011 and spring of 2012, as well as during the two selected cloud process on 11 September 2011 and 18 April 2012. Note that the statistical meteorology parameters for summer of 2011 and spring of 2012 were computed including rainy-days and cloudy-days.

Periods	T (°C)	RH (%)	WS (m s^{-1})	Visibility (km)
Summer, 2011	20.0 ± 4.5	88 ± 12	12.7 ± 9.4	11.6 ± 7.7
Spring, 2012	13.6 ± 4.3	76 ± 26	3.6 ± 2.8	10.7 ± 8.1
11 September 2011	20.7 ± 0.4	99	1.7 ± 3.8	0
18 April 2012	13.3 ± 0.9	99	0.5 ± 0.5	0

Figure R1-1. The thick cloud/fog on 18 April 2012 around the cloud water sampler.

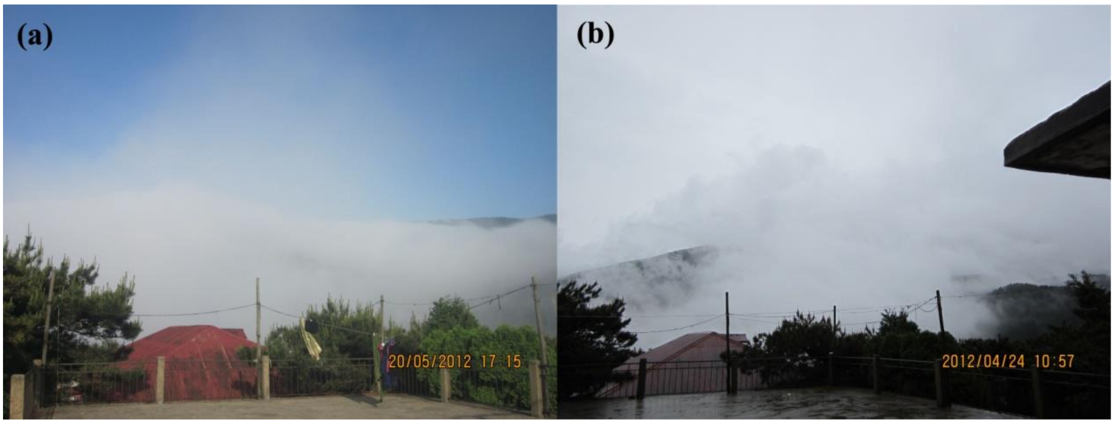

Figure R1-2. Scenes before (a) and after (b) cloud events observed at the sampling site.