Dear Ali Omar,

Many thanks for posting this helpful Short Comment on the use of CALIOP data in our paper. Please find our response below.

Kind regards,

Anne-Marlene Blechschmidt

1.) *Blechschmidt et al (in discussion) have successfully used satellite data, in situ measurements and numerical models to track dust storms from Icelandic dust sources. While CALIOP was used to confirm some of the findings, the authors have reached conclusions about the presence of dust in north western land regions that causes them to ignore CALIOP's data. CALIOP shows the presence of aerosols and in particular dust mixtures in these NW regions of Iceland on the date in question in February. First, we do not agree that it is rational to ignore data in one region because it might be in doubt in another. Secondly, the authors' concerns about the presence of dust are not adequately supported, and are in fact contrary to existing evidence from their Fig 5 and the work of Arnald et al. (2010) which is also cited in this paper.*

We agree that not showing the data due to concerns on the aerosol classification over the north-western Icelandic land surface is not a strong argument. A more detailed discussion of the CALIOP observations is required. The observations over the ocean, in the wake area near Iceland's south coast add valuable information to this case study on an Icelandic dust storm. Hence, we plan to include a more careful analysis on CALIOP in a revised version of our manuscript. However, we do not see any obvious evidence from Fig. 5 shown in our paper about the presence of dust over the north-western Icelandic land surface (see answer to point 2) and Arnalds et al. (2010) (see answer to point 3).

2.) *We defer to the authors' geographic experience with the region and agree that it is feasible that the CALIOP classification of aerosols and subtypes in the north western region may be in doubt, especially in the presence of blowing snow. However, arguments for total lack of dust are not supported by the data presented in this paper. In particular, Figure 5 - the MODIS TERRA true color image, which is one of the main arguments presented for lack of dust, is inconclusive at best, and may in fact show the presence of dust. Here we call your attention to the brown hue of these north western clouds suggesting the presence of dust. The paper should also address the temporal mismatch between the MODIS image (Feb 25) and the date analysed in this paper (Feb 21) for which CALIPSO data is quoted.*

Information on snow cover was mainly deduced from visual inspection of MODIS true color images. A lot of clouds were present on the flight day (22 February 2007) which precluded exact derivations of snow cover information from satellite true color images on that specific day. This is described on page 8, last paragraph of the current version of the paper. However, satellite images from 24 to 25 February are largely cloud free. Furthermore, on other days around 22 February not all parts of Iceland were hidden by clouds. Combining the snow cover information from 24 to 25 February with the more fragmentary information deduced from the other satellite images around 22 February, we conclude that the satellite image from 25 February (Fig. 5 of the paper) is to a good approximation representative of the snow cover on the flight day (22 February) and the day of the CALIOP observation (21 February).

Fig. 1 given below shows the CALIPSO track discussed in section 5 of the manuscript. The corresponding CALIOP data shows a lot of dust between approximately 63.25° N and 66° N. Winds from a WRF/Chem simulation (Fig.2 below) show north-easterly wind directions over Iceland close to

the time of the CALIOP observation. The widespread presence of dust for latitudes larger than 64.75° N in the area of the CALIPSO track is unlikely, given the wind directions and that most parts of north-west Iceland were covered by snow. Southeasterly winds would have been required in order to transport dust to this area. Moreover, we find it very hard to see any obvious hue of north-western clouds in Fig. 5.

3.) *Furthermore, according to Arnald et al. (2010), most of the dust generated on the land sites towards central and northern regions do deposit in the north west (see Figure 5 of Arnald et al. (2010)). There is considerable deposition and overlap from source regions S4 and S2 to the CALIPSO ground tracks which traverse both of these regions.*

The CALIPSO track described in our manuscript is the one for 21 February 2007 at 04:15 UTC. This information needs to be added to a revised version of the paper. This track slightly missed deposition areas S4 and S2 displayed by Fig. 5 of Arnalds et al. (2010) which follows from a comparison with Fig. 1 shown below. The track was chosen since it crosses the area of low winds where dust was observed during the flight campaign later on 22 February 2007. Other CALIPSO tracks between 21 February and 23 February either did not cross the area of interest or are much more interrupted by clouds.

We would like to make clear that according to Fig. 12 of Arnalds et al. (2010) north-west Iceland generally has the *lowest* aeolian deposition rates in Iceland and that a lot of the dust transport is directed towards the south due to northerly winds. Moreover, Arnalds et al. (2010) point out that there is less deposition in winter in all areas except the south due to snow cover.

4.) *In light of these observations, we would like to encourage the authors to present their results along with CALIOP observations where there is agreement with CALIOP and exclude the remark that reads "Hence, we do not present CALIPSO results here, due to concerns about the reliability of the data" as this is not neither helpful nor factual. The CALIPSO team is ready to provide assistance to interpret the data and strengthen the observational basis of this important paper.*

The remark will be excluded and the CALIPSO data will be discussed in more detail in a revised version of the manuscript (see answer to point 1). Thanks to the CALIPSO team for offering assistance to interpret the data.

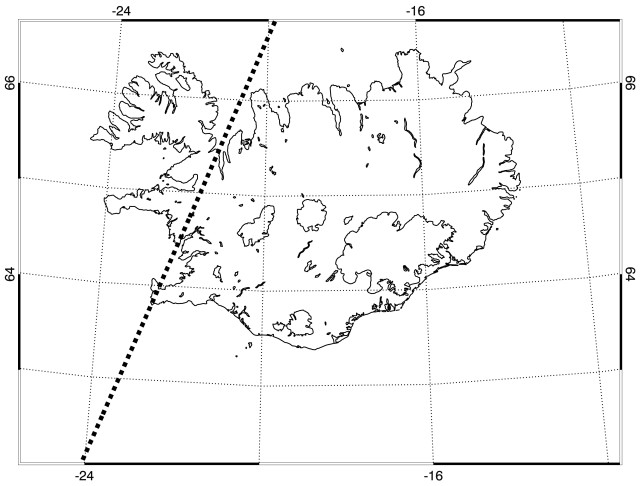

Fig. 1. The CALIPSO track (dashed line) for 21 February 2007 04:15 UTC.

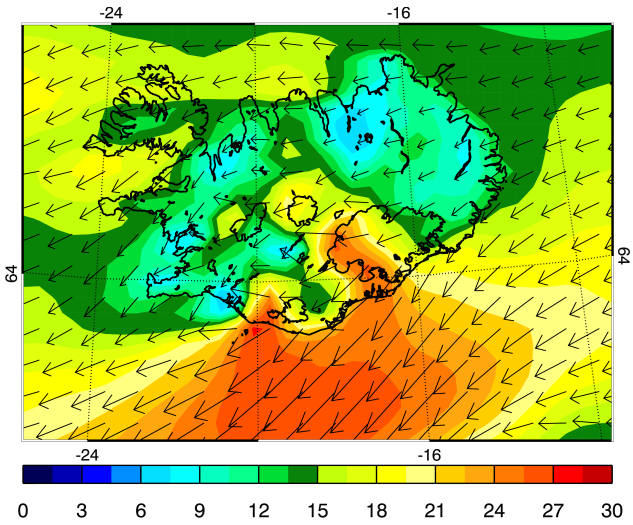

Fig. 2: Wind speed [m/s] (colored shadings) and wind direction (black arrows) from a WRF/Chem simulation at the lowest model level for 21 February 03:00 UTC.