To Editor of Geophysical Research Letters

Comments on paper by Ansmann, A., et al. (2010) entitled “The 16 April 2010 major volcanic ash plume over central Europe: EARLINET lidar and AERONET photometer observations at Leipzig and Munich Germany” published by the *Geophysical Research Letters* (37, L13810, doi:10.1029/2010GL043809).

Ansmann, A., et al. (2010) are discussing volcanic aerosol optical properties measured by the EARLINET lidar and AERONET photometer in April 2010.

Their analysis is focused on the observations of volcanic ash plume on 16 April 2010 over Leipzig and Munich in Germany. These observations are of a great interest however some of the main results and their interpretation presented by the authors are rather questionable.

The authors claim to ‘observe the optically thickest volcanic ash plume ever measured over Germany’. They base their statement on observations of ‘the total 500nm aerosol optical depth in Leipzig reached 1.0, and the ash-related optical depth was about 0.7’. These are highly questionable values as they do not relate to only aerosol component of the atmosphere. In the capture to Fig. 2 authors explain that the mentioned results claimed for observations on 16 April 2010 are based on the AERONET data level 1.0. Unfortunately, authors do not explain that the AERONET data from this level are not cloud-screened and hence that their total 500nm aerosol optical depth may contain a strong cloud component. We understand that on 29 April 2010 when the manuscript was submitted by the authors to *Geophysical Research Letters* (only 2 weeks after observations on 16 April 2010 where taken) the AERONET cloud-screened data of level 1.5 or cloud-screened quality-assured data of level 2.0 were not available. Even in this case, the authors could preprocessing the 1.0 level data to minimize the cloud effect on the aerosol optical depth. Although now AERONET lev. 2.0 data are available for the whole period of this volcanic event. However, during 16 April 2010 there are no data evaluated up to the level 2.0, which indicates cloudy conditions during whole day. In addition, cloudy condition are clearly visible at satellite images obtained with SEVIRI at MSG2 and AVHRR at NOAA. Although authors present also a 12 UTC radio sounding profile which indicates only a thin cloud layer around 6 km, when one bares in mind that this profile is obtained from Lindenberg located in a distance of 180 km from Leipzig, one has to admit that this atmospheric profile is not representative for the latter measurement site. Hence, on 16 April 2010 only the ‘cloud component’ brought up here can explain such an extremely high value (1.0) of the total 500nm aerosol optical depth for Leipzig. Such explanation is confirmed by the fact that on the following day 17 April 2010 available AERONET data of level 2.0 show for the Leipzig the total 500nm aerosol optical depth varying in the range of values between 0.15 and 0.2. On this day (17 April 2010) similar values ranging from 0.11 up to 0.16 were measured with Mictotops sun photometer at the Institute of Geophysics University of Warsaw, Poland, located about 650 km North-East from Leipzig (Markowicz et al., 2010). On 17 April 2010 the AERONET station in Belsk, Poland, located another 50 km North-East of Warsaw obtained values between 0.12 and 0.2 for data product of level 1.5.

Authors state that ’the Leipzig AERONET photometer registered peak aerosol optical depths around 1.0 and ash–related values up to 0.7 at 500 nm from 13.20–13.40 UTC on 16 April

2010’ and further state that ‘volcanic-ash-related optical depths as high as 0.7 – 1.2 at 500nm were observed over Germany on 16 April 2010’. These results were obtained from sun photometer and lidar observation. It is very likely that similarly to the total optical depth also this ash-related values are affected by the cloud component. For comparison estimated by Markowicz et al., (2010), the ash-related aerosol depth obtained from CHM-15K ceilometer and Microtops sun photometers observations in Warsaw on 17 April 2010 was only 0.03-0.05 at 500nm.

In the paragraph 8 the Angstrom exponents computed from the AERONET data are discussed. Authors said, that this parameters drops do values 0.35-0.40 (for wavelengths 500/1640 nm) when the highest ash load was observed between 1300 and 1400 UTC. Using the not cloud-screened data can leads to large error in the Angstrom exponent estimation because of small value of this parameter for cloud. In addition, comparison of obtained results to values for Saharan dust observed in the southern Morocco does not make sense.

On Fig 3 authors show various lidar profiles of the aerosol optical properties, which were computed only for data points ‘carefully screened for cloud’. However, authors do not explain how this cloud screening was done, how it affected the retrieved profiles (lack of any error analysis and discussion) and to what extend these data contain cloud effect. Large value of the aerosol optical depth estimated form the volume extinction coefficient profiles on 16 April 2010 in the layer between 2.5 and 4 km presented on Fig. 3.b is in the order of 0.3 at both 355 and 532 nm for Leipzig. Although much lower than the value estimated by the authors from 500 nm AERONET data, still the value obtained at 532 nm from the lidar measurement is very high and very likely contaminated with clouds. Therefore the particle depolarization ratio presented in Fig. 3.c varies between 0.25 and 0.4 in the discussed layer (2.5 – 4 km) for Leipzig on 16 April 2010 is probably caused be the ice clouds.

Summarizing, the upper panel of Fig 1 and Fig 2 are not related to the aerosol optical depth and the Angstrom exponent due to the fact that those measurements are strongly affected by clouds. Author should be much more careful when using the AERONET data.

Krzysztof Markowicz

Reference

Markowicz Krzysztof, Olga Zawadzka, Iwona Stachlewska, Observation of a volcanic ash over Poland in April 2010, *8th IAC*, Helsinki 2010.