

Interactive comment on “Atmospheric new particle formation characteristics in the Arctic as measured at Mount Zeppelin, Svalbard, from 2016 to 2018” by Haebum Lee et al.

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Interesting paper, however, I have some comments regarding the origin of the particles and/or precursors.

The authors claim, that due to the small size occasionally observed the particles have to be produced in the vicinity of the Zeppelin station. That's plausible. However, in that case it would be interesting whether anthropogenic emissions for example from the port may contribute. The frequency of particle events fits well into the frequency of ships in Ny-Alesund. That port and ships affect the site is clearly shown for example in Eckhardt et al, 2013, here also the typical meteorological conditions for such an

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anthropogenic contamination at Zeppelin.

The event day May 14, 2018 is one of these days with low and variable winds at the Zeppelin site discussed in the Eckhardt paper (see also the PANGANEA meteorological data for this day). Also HYSPLIT, when calculated with the higher resolution of 0.5 degree instead of the default GDAS 1 degree shows an air mass trajectory sweeping over the Kongsfjord and the port of Ny-Alesund while the 1 degree resolution does not show this Ny-Alesund loop. A more detailed local meteorology would be very helpful in the search for the origin of nucleation mode particle precursors.

Second, the presence of cruise ships is roughly the same like the frequency of particle events during the summer months (May to August). These ships stay in the port normally for the daylight hours and leave the port at 16:00 local time. However they are often in the fjord even for a longer time span. For the port there is the harbor keeping a record. For the whole archipelago the AIS database (www.marinetraffic.com) may be used. Ships are emitting a huge amount of ultrafine and even nucleation mode particles, especially when they are equipped with catalysts for NO_x removal in emission control areas, see for example Kivekäs et al, 2014 or Kecorius et al, 2016. A single cruise ship in the vicinity (and up to 50 NM upwind) thus might be a dominating source of either primary nanoparticles or of nanoparticle precursors, especially in the otherwise pristine environment of Spitzbergen where normally sulphur compounds are thought to originate from DMS (open sea) and ammonia from seabird colonies (islands).

It would be good when such anthropogenic contamination could be excluded. Enclosed is the HYSPLIT analysis for May 14, 3 trajectories, two hour intervals

References Eckhardt et al. *Atmos. Chem. Phys.*, 13, 8401–8409, 2013, www.atmos-chem-phys.net/13/8401/2013/, doi:10.5194/acp-13-8401-2013

Kivekäs et al, 2014, *Atmos. Chem. Phys. Discuss.*, 14, 8419–8454, 2014, www.atmos-chem-phys-discuss.net/14/8419/2014/doi:10.5194/acpd-14-8419-2014

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Simonas Kecorius et al, Significant increase of aerosol number concentrations in air masses crossing a densely trafficked sea area, *Oceanologia*, Volume 58, Issue 1, 2016, Pages 1-12, ISSN 0078-3234, <https://doi.org/10.1016/j.oceano.2015.08.001>.

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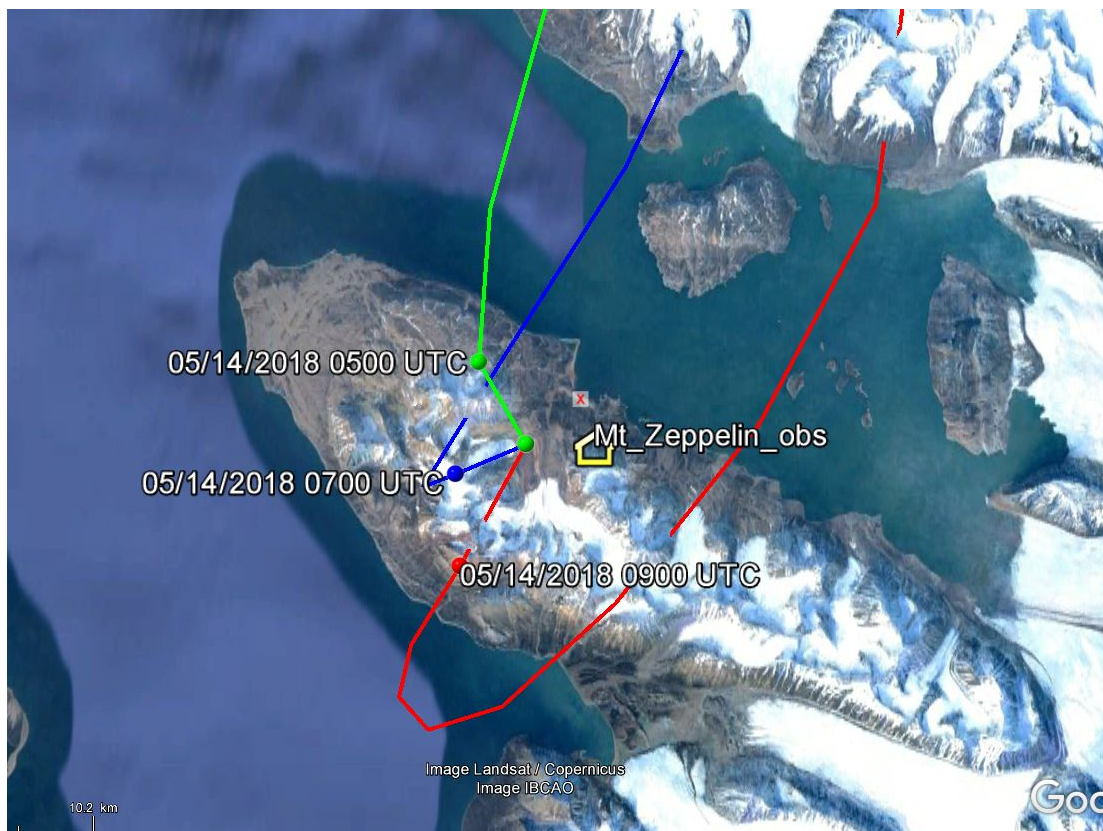


Fig. 1.

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