

## ***Interactive comment on “Vortex-wide chlorine activation by a mesoscale PSC event in the Arctic winter of 2009/10” by T. Wegner et al.***

### **Anonymous Referee #1**

Received and published: 26 January 2016

T. Wegner et al. describe in this study the evolution and distribution of PSCs and chlorine activation in the Arctic winter 2009/10 with the help of observations from CALIOP, and MLS, as well as with model results from CLaMS. They show that only a small area, with initial temperature conditions for the formation of mesoscale PSCs, is sufficient to activate chlorine in more or less the whole vortex. They also show that chlorine activation is visibly faster with increasing surface area density (particularly with respect to the activation only on binary background aerosol), and that ClONO<sub>2</sub> is the limiting factor for chlorine activation.

In my opinion this study is a very important contribution to the science of polar ozone. The scientific approach and the methods are well described and performed, and the results are discussed in detail. The presentation quality and the English language is

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excellent. I therefore recommend this study for publication after some minor technical corrections:

Page 33733, line 23-25 and page 33734, lines 4 and 12: Please be consistent with the abbreviation in the text: Either you write the abbreviation always in brackets or always outside the brackets. Here you write CALIOP outside the brackets and MLS inside the brackets, CALIPSO outside and STS and NAT inside. . .

Page 33733, lines 23 and 25: Maybe you can already add here the citations for CALIOP (-> Winkler et al., 2009) and MLS (-> Waters et al., 2006)

33733, 25: “in combination with chemistry transport model calculations” -> “in combination with model calculations of the chemistry transport model CLaMS (citation?)”

33735, 6: Please change “(NAT, nitric acid trihydrate, existence temperature)” in “(NAT existence temperature)”

33735, 21/22: “in backscatter with” -> “in backscatter at 532nm with”

33735, 27: -> “particle surface area density (SAD) of PSCs ”

33736, 15: Maybe “calculated” instead of “computed”

33736, 19: You use in chapter 3 and in Figure 4d the value  $1.5 \times 10^{-4}$  instead of  $3$  to  $5 \times 10^{-4}$  as threshold for ice PSCs (also in 33735, line 24). What is the correct value?

33736, 25: “In December 2009, . . .” -> “End of December 2009, . . .”

33736, 26: “liquid/ice PSCs” -> “liquid and ice PSCs”

33738, 17: Is “5 January 2010” here correct, or do you mean “31 December 2009”?

33738, 19: In my opinion “Barents Sea” is not correct for the the discussed area. Please check this again. The Barents Sea is North of Norway and the European part of Russia. I think you describe rather the area around the North Pole, or?

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33741, 20-22: This single trajectory on 6 January is not shown, or? Please add this at the end of the sentence.

Fig. 3e: What is the meaning of the single blue line (top left in the panel)?

Fig. 3f: There is gap in the black and magenta line. Please correct this.

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 33731, 2015.

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