Reviewer comments for manuscript acp-2014-599: *Ice crystal concentrations in wave clouds: dependencies on temperature, D > 0.5 μm aerosol particle concentration and duration of cloud processing*

General Remarks:

The manuscript by Peng et al (2014) presents a comparison of ice crystal concentrations measured in middle – tropospheric wave clouds over Wyoming and Colorado with predicted ice nuclei number concentrations based on a parameterization developed by DeMott et al. (2010). Minimum cloud temperatures and number concentrations of aerosol particles of a diameter above 0.5 μm which were measured upstream of the wave clouds are used as input to the parameterization. The manuscript affirms the validity of the parameterization for wave clouds by means of a different experimental method than used for the parameterization. Furthermore, the article addresses the topic of time – dependency of ice nucleation by looking at the effect of the length of exposure of ice nuclei to water-saturated conditions in wave clouds. No statistically robust evidence for a time – dependency is found.

The study is of interest to the community because it presents a good agreement between the results of different measurement methods derived in the field. Therefore, I recommend the manuscript for publication in Atmospheric Chemistry and Physics after the following minor comments have been addressed.

In general regarding the references: please be consistent when citing and provide the DOI for all sources.

Specific Remarks:

Page 26594

line 15: change ‘in’ to ‘on’

line 24: ‘heterogeneous ice generation can be distinguished …’ : Please be more specific in how they can be distinguished

Page 26596

line 25 ff.: to readers who are not familiar with FSSP, PCASP and 2DC measurements it might not be clear from the description that evaporation is intended or may be a problem of the instrument. Please be more explicit here.

Page 26600

line 7: ‘This is shown, for the example,..’: delete ‘the’

Page 26602

line 6: Please describe more explicit the effect you observe of ice nucleation on cloud properties which is evident in Figure 1.

Page 26604

line 7: A short description of D10's three-step procedure would help the reader to follow the method described in this manuscript.

Page 26605

line 4 ff.: Is the fraction of the measured crystal concentrations that plot within a factor of two of the fit still significantly different if the error of the measured ice crystal concentrations is taken into account?

Page 26606

line 11 ff.: Is should be stressed more that already the original D10 equation fits well to the measured data. This is of high value because of the very different measurement methods.

Page 26606

line 20: insert 'ice' before 'nuclei'