

***Interactive comment on “Global Spectroscopic Survey of Cloud Thermodynamic Phase at High Spatial Resolution, 2005–2015” by David R. Thompson et al.***

**Anonymous Referee**

This manuscript develops a very useful approach to investigate cloud thermodynamic phase based on data from 2005-2015 obtained by the Hyperion imaging spectrometer on EO-1. The approach combines spectrum fitting and spatial scale analysis. The validity is demonstrated with a comparison with AIRS.

I recommend the work for publication in AMT after addressing/clarification of the comments listed below.

Page 3, Eq. (3): The introduction/use of ‘m’ and ‘n’ is confusing. The development in equations (2-3) should be clarified. What about error due to this approximation?

Page 4, line 8-9: ‘These bulk absorption spectra were generally independent of particle scattering and did not relate directly to particle size’. Is there a reference or evidence for this statement?

Page 5, Eqs. (8-9): Are the "m" and "n" the same variables in Eq. (3)?

Page 5, Eq. (9):  $\chi^2$  should be divided by number of degree of freedom because your fit uses a reduced Chi-Square, which is defined as ‘Chi-Square per degree of freedom’. So  $\chi^2=1$  is a conservative estimate of measurement noise as shown in Fig.4. Please clarify.

Page 11, Eqs. (15-16): I believe that the authors made a typo for the offsets. It should be

$$vN(d)=0.0058d^{0.44}+0.012 \quad (15)$$

$$vS(d)=0.0046d^{0.42}+0.010 \quad (16)$$

Please check.