Review

Nonlinear Processes in Geophysics, Discussion paper
TITLE: Subvisible cirrus clouds – a dynamical system approach.
AUTHOR(S): E.J. Spreitzer, M. P. Marschalik, and P. Spichtinger

Summary

For the investigation of sub-visible cirrus clouds as formed by homogeneous freezing a simple analytical cloud model is developed from first principles. The presented results are interesting and in general relevant and important for improving the understanding the evolution of cirrus cloud. However, some clarifications and minor corrections need to be introduced before publication, improving the physical understanding of the presented results. Especially, the equations written down are in a form which is difficult to understand, covering or disguising the used first principles. Therefore, I can recommend the manuscript for publication in Nonlinear Processes in Geophysics after **revision**, taking into account the following major and minor review points:

Major review points

1. Chapter 2, page 3, line 78: What is the meaning of the term ”Boltzmann-type way”? Equation (1) is a balance equation of a mass distribution in space-time plus a divergence-term in an additional internal phase space. The meaning of this last term in the left hand side of (1) is beyond the classical fluid dynamical setting and this needs more explanation.

2. Chapter 2.5. Why do you change from the Eulerian to the Lagrangian description? Can you explain ore motivate this step in more details? Moreover, the two terms in (31) cannot be seen as a Lagrangian conservation law. (d(\rho\phi)/(dt)= \partial(\rho\phi)/(\partial t) + advection of \rho \phi and not the divergence of the flux (\rho {\bf v} \phi.). This should be made clear.

3. Chapter 2.6, page 11, line 303-314: Here, the 3D-system of the ordinary differential equations is written down explicitly. However, in this form the internal dependence and overall structure of the model equations are hard to understand. Can you write the equations in a more principle way? Which terms are linear or non-linear, which terms are conservative, and which are dissipative, leading to the attractor in phase space? Can you calculate e.g. the divergence in the phase space of the used variables.

Minor review points

1. Chapter 2.5 page 9, line 244: The names of the two physicists and mathematics Lagrange and Euler should be written correctly; like Lagrangian viewpoint or Eulerian time and so on. Please check the whole manuscript in this respect.