Atmos. Chem. Phys. Discuss., 5, S47–S50, 2005
www.atmos-chem-phys.org/acpd/5/S47/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Formation of ice supersaturation by mesoscale gravity waves" *by* P. Spichtinger et al.

Anonymous Referee #2

Received and published: 11 February 2005

General comment:

For a selected case the authors studied the formation and evolution of an ice supersaturated region (ISSR) which was observed by means of a radiosonde launched at Lindenberg. Different methods are used to handle the problem from different point of views. Beside the comparison with ECMWF analyses data, and a study of infrared Meteosat images, a mesoscale circulation model (MM5) was used for the examination of the dominant process of forming ISSR during that case namely vertical moisture advection due to inertia-gravity waves (IGW).

This is an interesting special case for the study of the formation and evaluation of ISSR,

but the shown results and presented arguments do not convinced the reader that the vertical moisture advection really causes the observed ISSR. Only indications for that are presented.

I think the authors should carefully differ between believable results and speculations. I miss a discussion section where especially the model results are assessed, for instance their robustness. Why is the MM5 specific humidity not compared with the one of the radiosonde? What do you know about differences? How is the possible adiabatic uplifting, induced by the large-scale flow, separated from the IGW induced uplifting? Do you identify some ISSR or Cirrus clouds in the MM5 simulation? Are they found at the right position?

Further, an attempt was prepared to visualize the horizontal distribution of possible ISSRs and Cirrus clouds. How could you checked that, may be by using other radiosondes or radars from the European network?

Specific comments:

1. +p71,§1: The errors of the radiosonde measurements should be mentioned!

2. +p75,§2l5-6: Why is the temperature of the air parcels much colder? Not clear!

3. +p79,§2: I would prefer 250 - 300 km for the zonal wavelength.

4. +p79§3,p80§1-2: The energy propagation direction from the hodograph analysis is not in agreement with the related wave vector between 7 and 11 km deduced from phase lines of Fig. 7. +Cancel Fig. 8 and use the dispersion equation to estimate the intrinsic frequency, by known horizontal and vertical wavelength from Figure 6 and 7. Further, why are you using model results at 01:00 UTC? The radiosonde started about 90 minutes before.

5. p81,§2: The separation of large scale adiabatic uplifting and moist vertical advection by IGW is not clear for me, if you are using trajectories for instance?

ACPD

5, S47–S50, 2005

6. p81,§3. I see no superimposed wave. There are two components from different sources but well separated. Over Lindenberg the jet generated wave determines the uplifting.

7. p82,§2, introduce a discussion section

8. p82§4, Where are the factors (1.5 to 1.75) coming from?

9. p84,85, What is going on with the MM5 relative humidity, you mentioned only ECMWF analyses? Compare it with the RS measurements!

10. p99, 100, Fig. 11/12, I do not understand which conclusions follow from both Figures, in relation to the process of moist vertical advection by IGW (as far as they show the correct distribution of ISSR and Cirrus clouds). I would expect a structure similar to the IGW distribution.

Technical comments:

1. - p68, p71, p82, at different places different ISSR intervals are presented + use only one

2. - p71, headline +add “00UTC”

3. - p71, Where is the tropopause exactly placed, about 185 hPa or 183.2 hPa? + use only one

4. - p71, The relative humidity does not strongly increase up to 300 hPa. + before 300 hPa is correct

5. - p74, 220 $<$ p $<$ 450 hPa and uplift + better to change to “450 hPa $<$ p $<$ 220 hPa”

6. -p75, later times (Fig. 4) + better (Fig. 4a, b)

7. -p79 , Lx +Do you mean Lh?

8. - p82 , t=+12h + Do you mean t=0h as in Fig. 12?

ACPD

5, S47–S50, 2005

Interactive Comment

9. -p83, a da + a day

10. -Fig.1 +PV and winds at 300K may be better for indicating the large-scale flow structure

11. -Fig. 2 +introduce date and time of RS

12. -Fig. 6 +longitude

13. -Fig. 7 + introduce more values of wind speed, not enough

14. -Fig. 11/12 +How this PV is estimated on pressure levels, unclear?.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 67, 2005.