

## ***Interactive comment on* “Turbulence associated with mountain waves over Northern Scandinavia – a case study using the ESRAD VHF radar and the WRF mesoscale model” by S. Kirkwood et al.**

### **Anonymous Referee #2**

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This is a good and well-written paper. In my opinion it will be acceptable for publication subject to some minor revisions which the authors may wish to consider. These are described below.

Minor comments:

1. The level of agreement between the mesoscale model predictions of the mountain wave vertical velocities and those observed by the radar is acceptable, but also fairly unremarkable. These sort of comparisons are certainly not novel. There are many other published studies of numerical simulations of mountain waves where comparisons with radar and other observations are made. I think the paper would benefit

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from some (short) discussion of these in the introduction, emphasising the fact that we should expect a model with  $O(1\text{km})$  resolution to do a good job of representing the observed wave motion.

2. The representation of the synoptic scale (from NCEP analyses) is one possible reason why the precise details of the waves are not reproduced by the model. Another is simply that the wave motion may be at times highly nonlinear, effectively making accurate representation more challenging. Previous studies have highlighted how even small amplitude waves, when trapped (by decreasing Scorer parameter with height) can behave in a highly nonlinear manner. The nonlinearity, which results from wave-wave interactions, can result in amplification and unsteadiness, presumably making the waves less predictable. It would be nice to see some more discussion of the character of the simulated waves. For instance, is the structure of the Scorer parameter such that they are generally strongly trapped within the troposphere, or are they able to propagate freely into the stratosphere? The authors could then make some additional comments about the possible sources of error in the simulations. The character of the wave propagation is of course also very important in terms of wave breaking and mixing.

3. Figure 2 could be improved by adding shaded contours of wind speed and/or wind barbs to highlight the position and strength of the jet.

4. I found it hard to pick out the wave cloud structure in Figure 3. I wondered whether zooming in on the relevant region might help.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 20775, 2009.

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