Geoscientific
Model Development
Discussions

# Interactive comment on "Assessment of valley cold pools and clouds in a very high resolution NWP model" *by* J. K. Hughes et al.

**Anonymous Referee #1**

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Review of "Assessment of valley cold pools and clouds in a very high resolution NWP model" by J.K. Hughes, A.N. Ross, S.B. Vosper, A.P. Lock, and B.C. Jemmett-Smith.

General Comments:

The authors present a well-written and thorough analysis of a two-month high-resolution NWP model simulation, focusing on cold air pool formation at the site of the recent COLPEX experiment. The presented study clearly shows that the increase in the values of the vertical profile of critical relative humidity implemented for the higher resolution (100 m) inner model domain led to a significant increase in bias errors in minimum temperatures and longwave incoming radiation due to reduced cloud formation. Reduced cloudiness further led to an overestimate of cold pool formation and strength.

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Scientific questions / specific comments:

While the conclusions regarding the effects of the RH_crit are well founded, the authors further conclude that extended spin up times to allow for slowly evolving components of a model are not necessary to provide accurate results. I feel that this conclusion may hold for the Shropshire area, but the authors show not enough evidence that this is true for other areas where surface and soil types may show a much larger spatial and temporal variability. I do not think the authors intend to generalize this conclusion, and an additional sentence could avoid any misinterpretation of this conclusion.

Technical corrections:

Page 4458 Line 11: maybe replace "part" with "10 by 10 km" Page 4466 Line 7: add "downward" before "longwave"

Figures and annotations: I think the authors could improve the figures by adding consistent axis annotations, for example "Temperature (°C)" instead of using a mixture of "deg C" (fig 3) "K" (Fig. 5) , "degC" (Fig. 6). Figure 9, for example, has well labeled axis, listing the variable name and the units.

A consistent labeling of the times as either proper date or "day of model run" may further improve the figures.

Figure 4: Please check soil moisture content units. Shouldn't this be [kg / m3]? Do the values vary widely because the layer thickness varies?

Please check for reference to "100m_rhcrit" in figure annotations. In the text the run is referred to a "d100m_r"