

Reply

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We wish to thank Lai (1989) for pointing out the precise expressions for the differences between the various numerical approximations to the forcing terms on the right-hand-side of the ω -equation. We would also like to again emphasize the practical importance of these results. As stated in Durran and Snellman (1987) and Lai (1989) the sum of the Laplacian of the warm advection and the increase in vorticity advection with height *cannot* be accurately evaluated on a coarse resolution vertical mesh. In most meteorological applications, the vertical resolution is limited to the mandatory reporting levels in sounding data, which is rather coarse. Thus, any computer program designed to solve

the ω -equation should use the Q -vector form. Furthermore, if you cannot get it right on a computer, you are not going to be able to do the calculation in your head—so, forecasters should estimate the vertical motion by looking at the advection of vorticity by the *thermal wind* or by examining the divergence of the Q -vectors. Forecasters would do well to forget about the traditional expression involving the sum of the Laplacian of the warm advection and the increase in vorticity advection with height.

REFERENCES

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- Lai, C.-C., 1989: Comments on "The diagnosis of synoptic-scale vertical motion in an operational environment." *Wea. Forecasting*, **4**, 343–347.

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