

## Reply

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The picture of the energy cycle of stratospheric waves and its relationship to the association between wave amplification and wave growth presented by Hartmann is very useful and is strongly supported by energetic studies such as that of Perry (1967), as well as by Hartmann's analysis of the 1973 SCR data. However, as is often the case, the energetics point of view provides valuable insight into how a process takes place, but

does not by itself provide a fully satisfactory picture of the physical nature of the mechanism and consequently does not necessarily preclude other explanations. On the other hand, the normal mode viewpoint can provide a heuristic picture of mechanisms, but only if distinct modes do in fact exhibit their own distinctive responses to the appropriate components of forcing. The encouraging similarity between results of several theoretical

studies, based upon the latter viewpoint [these studies are reviewed by Leovy and Webster (1976)] have led us to interpret some of these results in terms of normal mode response. We believe this interpretation is particularly applicable to the traveling mode 2 in the Southern Hemisphere winter, which does not display the cycle of growth and propagation described by Hartmann, but, instead, propagates more or less continually. Distinct traveling waves may also be a component of the Northern Hemisphere winter flow, although the situation is much less clear than in the south (Deland, 1973). In particular, the growth propa-

gation relationship in the north may be associated with interactions between traveling and stationary components.

#### REFERENCES

- Deland, R. J., 1973: Analysis of the Nimbus 3 SIRS radiance data: Traveling planetary waves in the stratospheric temperature field. *Mon. Wea. Rev.*, **101**, 132–140.
- Leovy, C. B., and P. J. Webster, 1976: Stratospheric long waves: Comparison of thermal structure in the Northern and Southern Hemispheres. *J. Atmos. Sci.*, **33**, 1624–1638.
- Perry, J. S., 1967: Long wave energy processes in the 1963 sudden warming. *J. Atmos. Sci.*, **24**, 539–550.

### CORRIGENDUM

The following correction should be made in the article “Numerical Study of the Nonlinear Rossby Wave Critical Level Development in a Barotropic Zonal Flow” by Michel Béland (*JAS*, Vol. 33, pp. 2066–2078):

The term  $-\overline{J(\psi', \nabla^2 \psi')}$  should be added to the left-hand side of Eq. (2). This addition in no way alters the results, as this term was included in the finite-difference equations. A similar change should also be made in Eq. (4). Finally, in Section 4c2, line 10, one should read  $\epsilon$  instead of  $\epsilon^{\frac{1}{2}}$ .