Reply

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10 August 1978

I thank Drs. Burk and Staley for their comments on my paper.

Late in 1977 I noted the need to treat the frictional term in a proper manner and in January 1978 I showed that the contribution of the frictional forces to the (local or substantive) rate of rotation of wind direction can be written as in Eq. (3) of the Comments by Burk and Staley. A derivation of the friction term and a discussion of its magnitude are incorporated in a paper submitted for publication (Neumann and Lecluyse, 1978). The paper is a generalization of my paper commented on by Drs. Burk and Staley and, in fact, the principle embodied in Eq. (2) of their comments is the basis for the new treatment.

The introductory sentence in the Comments requires some correction. The most important contribution to the rate of turning of wind direction is made by the horizontal pressure-gradient force, as is natural in view of the fact that the pressure-gradient force is the prime mover. It is shown in the joint paper with A. Lecluyse that in the case of extratropical cyclones, the contribution to $\partial \alpha / \partial t$ by the horizontal pressure-gradient force is, in many cases, something like $2.5 \times 10^{-4}$ s$^{-1}$, whereas the Coriolis parameter in middle latitudes amounts to $(1-1.5) \times 10^{-4}$ s$^{-1}$. In the case of tropical cyclones, estimates prepared for us by Professor Richard A. Anthes indicate that at a radial distance of about 100 km for the eye center, the contribution of the pressure-gradient force is about $4 \times 10^{-4}$ s$^{-1}$ while the Coriolis parameter may be about $5 \times 10^{-4}$ s$^{-1}$.

REFERENCES