REPLY

1. My paper under reference (Asnani 1975) was received by the editor in 1973.

2. I clearly stated that my analysis was for non-divergent flow and that too for a simple sinusoidal wave perturbation. If these assumptions be valid, then the analysis is useful in any latitude. I stressed these limitations of my analysis and ended the paper with the statement that 'real perturbations in nature are far more complicated'. I was therefore not surprised to see later Gruber's (1974) hypothetical flow pattern showing momentum flux in opposite direction. It is an interesting analysis.

3. We can, in fact, postulate a variety of hypothetical perturbations — analytical or non-analytical— and show that *no simple rule will work on all occasions*. Even in non-divergent flow, it appears possible to have a streamline pattern in such a way that in a limited region, the trough is in a north– south direction but u,v field is highly asymmetrical on the eastern and the western sides of the trough, such that $\overline{u\,v} \neq 0$. The value of $\overline{u\,v}$ may be positive or negative. Of course, such a pattern cannot be represented by a simple sinusoidal expression postulated by myself or Gruber.

4. It has been shown by Gruber that even in case of divergent flow, the simple classical rule may or may not work. It does not fail for all divergent flows.

5. Gruber asserts that the simple classical rule almost always works in middle latitudes because the large scale flow is quasi-nondivergent and balanced in those latitudes; he thinks that it may be misleading in the tropics. To this, my submission is as under :

(*i*) Non-divergence of flow does not always insure success of the classical rule.

(*ii*) In the tropics, the eddy flow is mainly connected with "Standing eddy" type flow. Moving "transient eddies" have very small amplitudes; even their detection on tropical synoptic charts is often a problem.

(*iii*) "Standing eddy" flow which is the principal large-scale flow of the tropics is highly "balanced" and "quasi-nondivergent". This is amply supported

by the fact that non-linear balance equation gives a very good representation of flow field in the tropical regions even in the neighbourhood of the equator. As such, on grounds of relative divergence content of the large scale tropical and extratropical eddy motions, I am unable to see *a priori* reason why the simple classical rule of tilting troughs should "almost always" work in extratropical latitudes and fail in tropical latitudes. In my view, chances of success or failure of this rule are not very different in the tropics or the extra-tropics.

(*iv*) Large amounts of heat of condensation are pumped into the tropical atmosphere in narrow regions in short pulsations of time. Such releases of latent heat do not make large scale eddy flows highly divergent.

(*v*) I do feel that we need to have more observational studies in the tropical regions.

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