



Relation between the 100 hPa heat flux and stratospheric potential vorticity

Maarten Ambaum (1) and Yvonne Hinssen (2)

(1) Univ of Reading, Meteorology, Reading, United Kingdom (m.h.p.ambaum@reading.ac.uk), (2) Univ of Utrecht, IMAU, Utrecht, The Netherlands

The exchange of momentum between the stratosphere and the troposphere can be described with Eliassen–Palm flux vectors. Most compactly, the Eliassen–Palm vectors can be interpreted as eddy potential vorticity fluxes. This interpretation allows us to write down a simple analytical model for the change of stratospheric potential vorticity as a result from vertical Eliassen–Palm fluxes at the tropopause. In this model, the Eliassen–Palm fluxes at the tropopause “force” the stratosphere with a time-lag dependent on the wave propagation characteristics in the stratosphere.

It is shown that the analytical model can predict the variability of the potential vorticity in the stratosphere to a remarkable degree. Especially when major warmings occur, the model is able to predict about 80% of the variance in these warmings. On average, the model can predict about 50% of the stratospheric potential vorticity variance.

The implications of the success of this model are discussed.