



A GENERALISED FORM OF LAIT'S MODIFIED POTENTIAL VORTICITY

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Ertel's potential vorticity P is in wide spread use as a diagnostic of dynamical processes in the stratosphere. For a variety of applications however, the exponential increase of P with altitude is problematic. For this reason, Lait, (JAS, 1994) proposed a modified potential vorticity Π_L , where a physically meaningful scaling is introduced that removes much of the altitude dependence of P . Here we propose a generalised form of Π_L by introducing an additional degree of freedom in the scaling. Such a scaling may alternatively be derived by considering a more general form of potential vorticity, where polytropic temperature rather than potential temperature is used as a hydrodynamical invariant. This generalised form of Π_L possesses the same conservation properties as Π_L itself and as the classical potential vorticity P , but can be adjusted more closely to the specific situation under investigation.

Comparison, over a large altitude range in the stratosphere, of fields of the generalised modified potential vorticity Π_g with dynamical measures of the polar vortex edge and with observations of the long-lived trace gas N_2O show that Π_g constitutes a more intuitively interpretable quantity than Π_L .