

Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02068, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-02068
EGU General Assembly 2008
© Author(s) 2008



A new direction in clear-air turbulence forecasting based on spontaneous imbalance. Part I: Application of theory

J.A. Knox (1), D.W. McCann (2) and **P.D. Williams** (3)

(1) Faculty of Engineering, University of Georgia, USA, (2) McCann Aviation Weather Research Inc., Overland Park KS, USA, (3) Department of Meteorology, University of Reading, UK (p.d.williams@reading.ac.uk)

We present a new method of clear-air turbulence (CAT) forecasting based on the Lighthill-Ford theory of spontaneous imbalance and emission of inertia-gravity waves. A scale analysis of this theory for mid-latitude synoptic-scale flows identifies advection of relative vorticity as the leading-order source term. Second-order terms including the Jacobian, divergence-vorticity product, and cross-product of velocity with the gradient of divergence may also play non-negligible roles for situations in which $Ro < 1$ but not $Ro \ll 1$. Examination of these leading- and second-order terms appears to help explain the utility of previous, more empirically inspired CAT forecast diagnostics. We then combine the Lighthill-Ford theory with the turbulent kinetic energy approach of McCann to create a dynamically consistent, easily implemented and operationally superior CAT forecasting approach.