

A 1979-2012 climatology of Northern Hemisphere Available Potential Energy: source/sink regions, and short-term increase events

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Available potential energy (APE), defined by Lorenz (1955) as the difference between the total potential energy of an atmospheric state and an adiabatically redistributed atmosphere that is horizontally stratified and statically stable, has been used to estimate the amount of energy available in the atmosphere for conversion to kinetic energy by cyclones. A series of exact and approximate equations for APE have been derived to solve for the APE of the atmosphere, accounting for changing terrain and moist processes amongst other variables. Using these equations, estimates of total hemispheric APE and its generation, and conversion to kinetic energy have been used to explain the annual APE cycle, and short-term APE depletion events by individual mid-latitude cyclones (5-7 days) and multiple mid-latitude cyclones over time (7-15 days). However, short-term increases in APE are still not well understood. To address such issues, a 1979-2012 climatology of total, zonal, and eddy APE, along with APE generation, is first computed using both the NCEP Global Reanalysis 2 and the ERA-interim reanalysis data sets. Comparisons will be made between the different equations proposed in literature to address topography and dry vs. moist processes, and links to synoptic and global scale impacts will be examined. In addition, a climatology of short-term APE increase events will be compiled, with a focus on the synoptic-scale modulations of these events.