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The Kelvin-Helmholtz Instability in the Atmosphere: Comparisons of High Resolution Numerical Simulations, Cloud observations, and Aircraft Measurements. JOSEPH WERNE, NorthWest Research Associates, DONALD WROBLEWSKI, Boston University, BJØRN ANDERS PETTERSSON-REIF, Forsvarets forskningsinstitutt — Results are reported for high-resolution direct numerical simulations (DNS) of the Kelvin-Helmholtz instability (KHI) and ensuing turbulence for four different values of the Richardson number (Ri=0.05, 0.10, 0.15, and 0.20) in relatively large domains: (4λ, 2λ, 2λ) in the (streamwise, spanwise, vertical) directions. The resulting flow morphology and evolution depend strongly on Ri, and this can be used to determine the relevant values of Ri for the observed atmospheric motions using cloud observations and aircraft data. A conundrum results, with divergent values for Ri suggested by the different data sources. We will discuss resolution of this apparent paradox and describe our efforts to evaluate a census of atmospheric Ri values in the regions of the upper troposphere and lower stratosphere for which we have data. Other universal aspects of KHI-induced turbulence (independent of Ri) have also been discovered from the DNS results, and these will also be discussed.

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