

Adiabatic Method of Computing Vertical Motion

Vertical velocity can be computed (from only thermodynamic considerations) by solving for ω ,

$$\omega = \left[\frac{\partial T}{\partial t} + u \frac{\partial T}{\partial x} + v \frac{\partial T}{\partial y} - \frac{1}{c_p} \frac{dQ}{dt} \right] \div \left(\sigma \frac{p}{R} \right).$$

Thus, ascent (negative ω) can be induced by warm air advection or by addition of heat. When the environmental lapse rate is near the dry adiabatic rate, the stability is near zero. And since stability is in the denominator, low stability produces larger vertical motion, while high stability leads to smaller vertical motion.