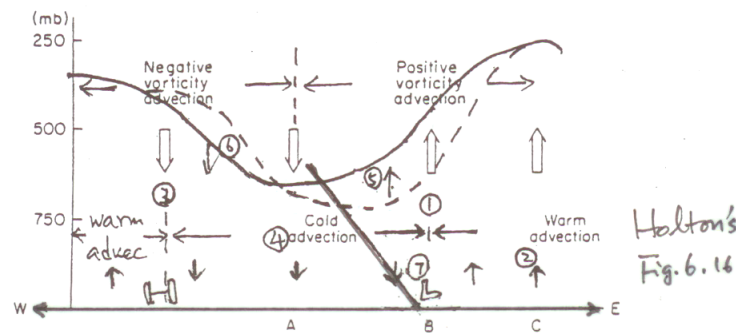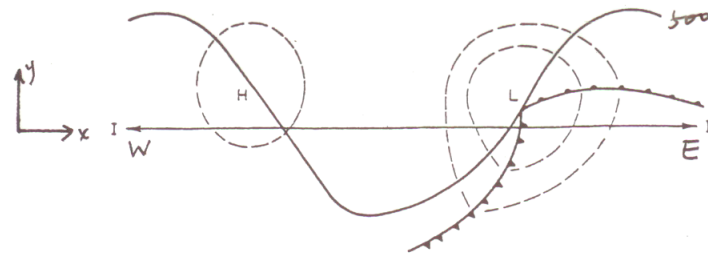## 7.5 Idealized Model of a Developing Baroclinic Wave

A. Based on ω equation [simple form: $w \propto \dfrac{\partial}{\partial z}(-V_g \cdot \nabla \zeta_g) - V_g \cdot \nabla T$]

(1) & (5):   PVA at 500mb -> Positive differential VA -> w>0.
(2):   Warm advection -> w>0.
(3) & (6):   NVA at 500mb -> Negative differential VA -> w<0.
(4):   Cold advection -> w<0.

B. Based on χ equation [simple form: $-\chi \propto -V_g \cdot \nabla \zeta_g + \dfrac{\partial}{\partial z}\left(-V_g \cdot \nabla T\right)$]

(5):   Ahead of 500 mb trough -> PVA -> $\phi \downarrow$ and

        cold advection near surface -> $\dfrac{\partial}{\partial z}\left(-V_g \cdot \nabla T\right) > 0$ -> $\phi \downarrow$.

(6):   Ahead of 500mb ridge -> NVA -> $\phi \uparrow$ and

        cold advection near surface -> $\dfrac{\partial}{\partial z}\left(-V_g \cdot \nabla T\right) > 0$ -> $\phi \downarrow$. ϕ?

C. Development of the surface low
(7):   (i) Overall w>0 creates surface convergence -> spin up surface
            positive vorticity -> low deepens.
        (ii) 500 mb vorticity strengthens due to PVA -> coupled with
            surface low.