

SIO 217B Atmospheric and Climate Sciences II

Exercise #26

1. a) Download the files containing T_{850} , u_{850} , and v_{850} for 1993 March 14 00Z. Calculate horizontal temperature advection in units of $^{\circ}\text{C day}^{-1}$ (as in Exercises #6 and #14). Plot contours of temperature overlaid by wind vectors in the domain $20\text{-}50^{\circ}\text{N}$, $270\text{-}310^{\circ}\text{E}$ using intervals of 4°C . Add contours of temperature advection using intervals of $25^{\circ}\text{C day}^{-1}$.
b) Download the files containing T_{500} , u_{500} , and v_{500} for 1993 March 14 00Z. Calculate horizontal temperature advection in units of $^{\circ}\text{C day}^{-1}$. Plot contours of temperature overlaid by wind vectors in the domain $20\text{-}50^{\circ}\text{N}$, $270\text{-}310^{\circ}\text{E}$ using intervals of 4°C . Add contours of temperature advection using intervals of $25^{\circ}\text{C day}^{-1}$.
c) Is horizontal temperature advection generally stronger in the lower troposphere (850 hPa) or in the middle troposphere (500 hPa)? Looking at your results for Exercise #14, is the strength of horizontal temperature advection at 700 hPa generally between that at 850 hPa and 500 hPa?

2. a) Download the file containing ζ_{850} for 1993 March 14 00Z and divide by 10 to convert to units of 10^{-5} s^{-1} . Using methods from Exercises #16 and #17, calculate horizontal absolute vorticity advection in units of $10^{-5} \text{ s}^{-1} \text{ day}^{-1}$. Plot contours of absolute vorticity overlaid by wind vectors in the domain $20\text{-}50^{\circ}\text{N}$, $270\text{-}310^{\circ}\text{E}$ using intervals of 5 (actually $5 \times 10^{-5} \text{ s}^{-1}$). Add contours of absolute vorticity advection using intervals of 50 (actually $50 \times 10^{-5} \text{ s}^{-1}$).
b) Download the file containing ζ_{500} (not *smoothed* ζ_{500}) for 1993 March 14 00Z and divide by 10 to convert to units of 10^{-5} s^{-1} . Calculate horizontal absolute vorticity advection in units of $10^{-5} \text{ s}^{-1} \text{ day}^{-1}$. Plot contours of absolute vorticity overlaid by wind vectors in the domain $20\text{-}50^{\circ}\text{N}$, $270\text{-}310^{\circ}\text{E}$ using intervals of 5 (actually $5 \times 10^{-5} \text{ s}^{-1}$). Add contours of absolute vorticity advection using intervals of 50 (actually $50 \times 10^{-5} \text{ s}^{-1}$).
c) Is horizontal vorticity advection generally stronger in the lower troposphere (850 hPa) or in the middle troposphere (500 hPa)?