The effect of Zagros Mountain on the summertime subtropical anticyclone over Iran

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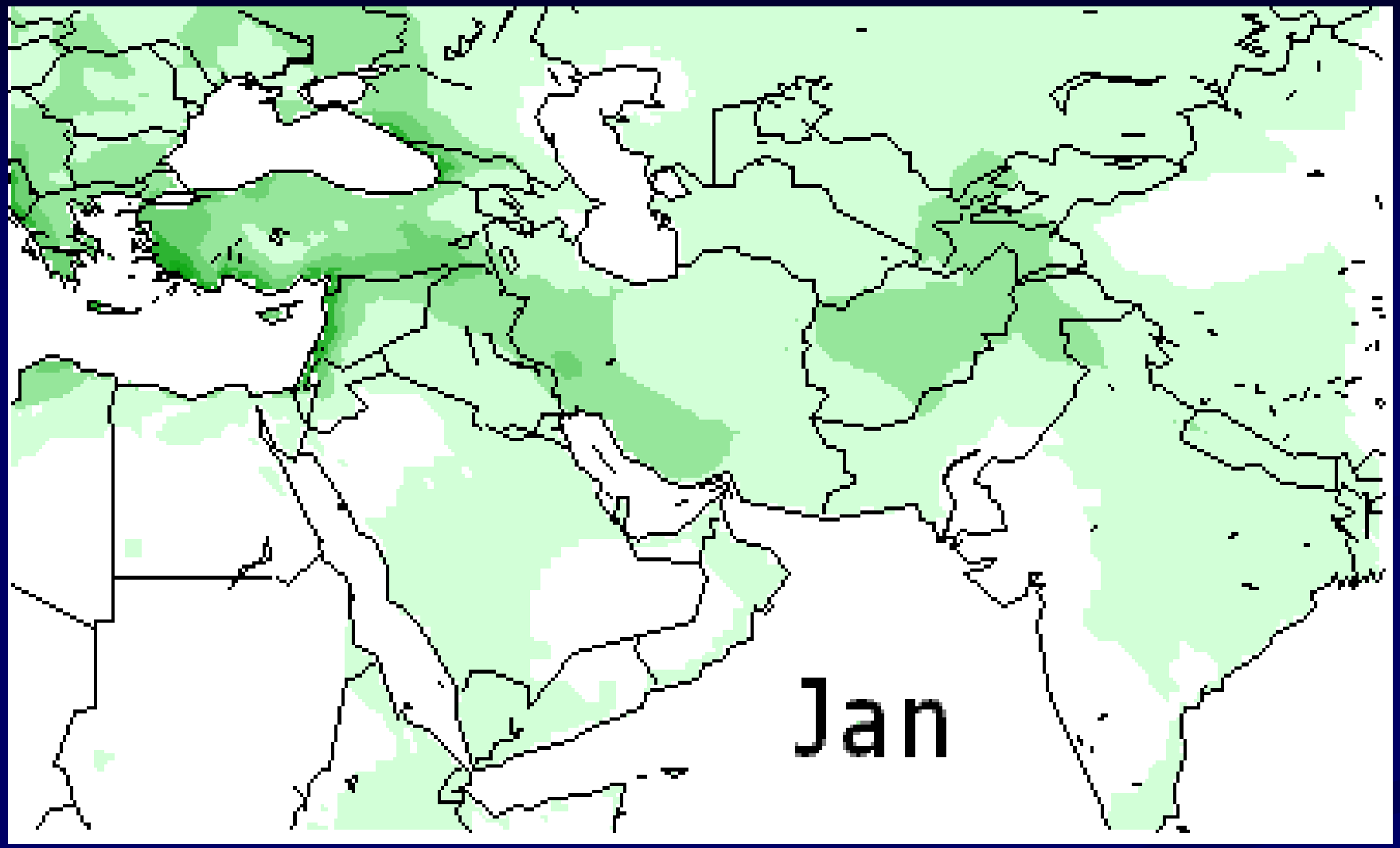
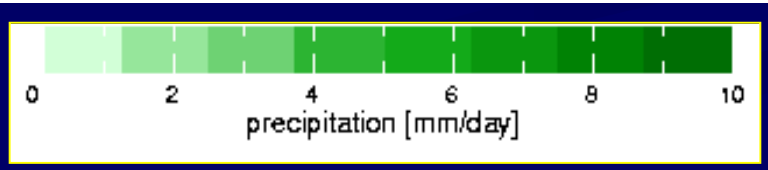
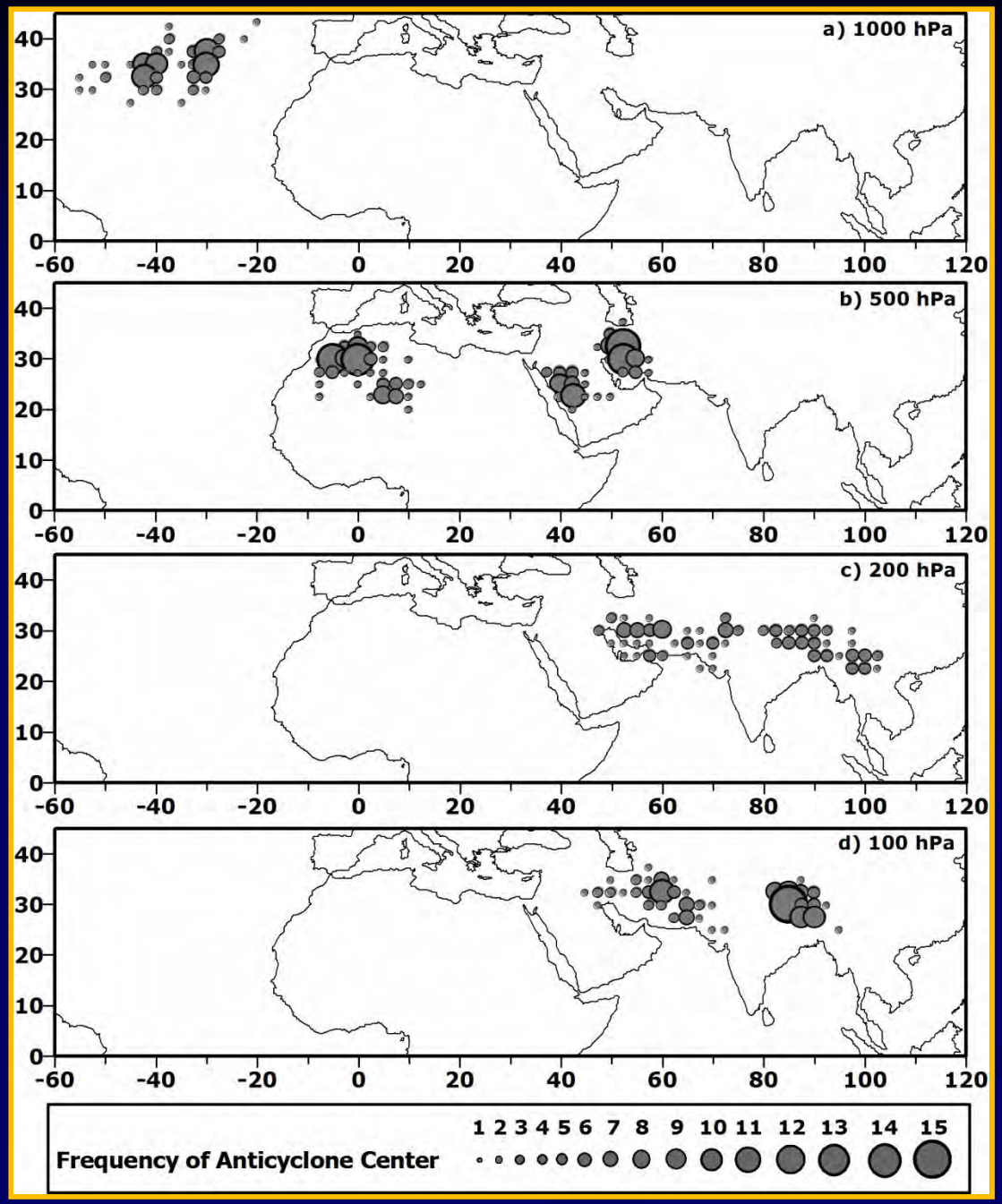
Monthly Mean Precipitation

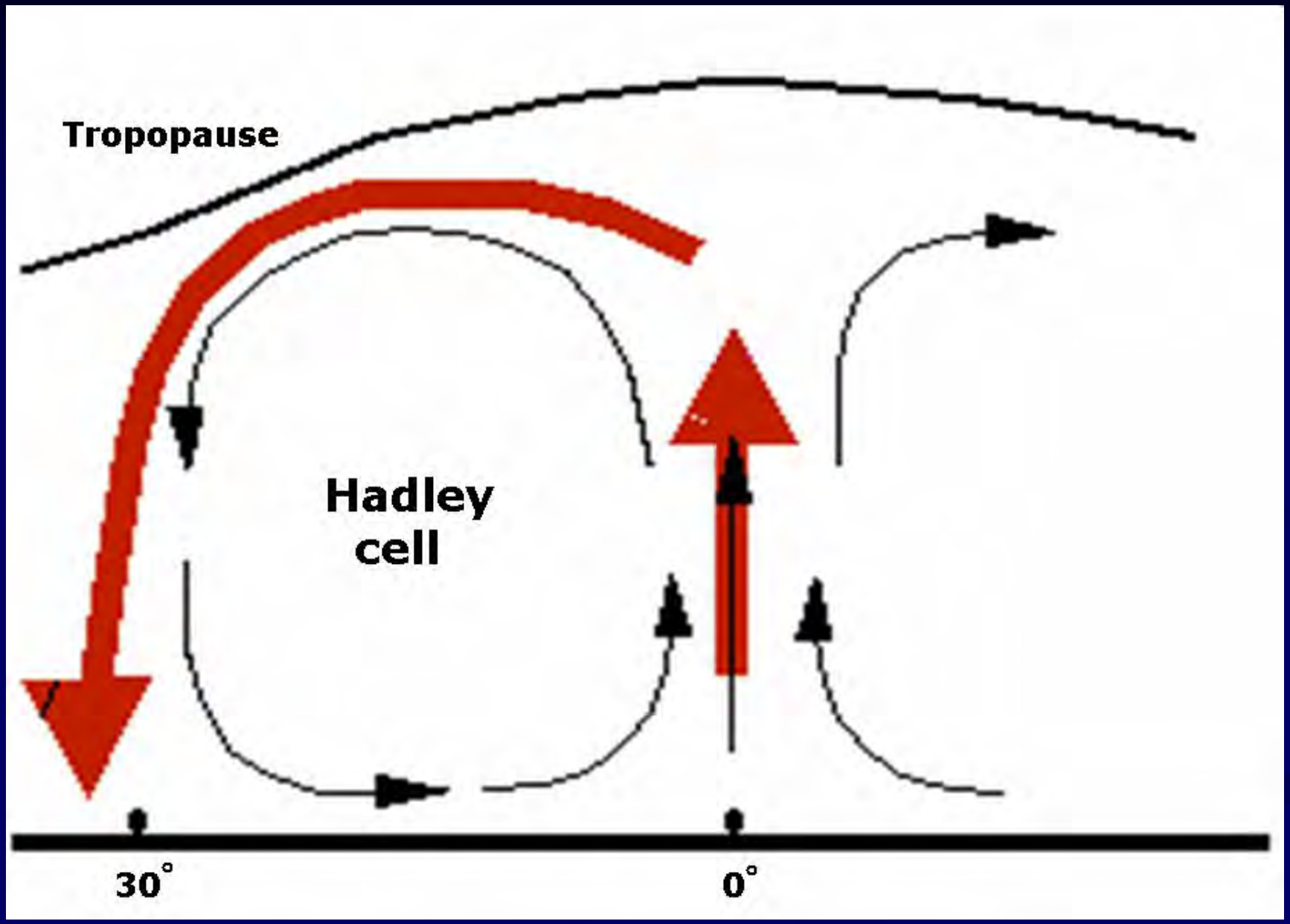




Frequency of closed subtropical anticyclones centers (JJA)



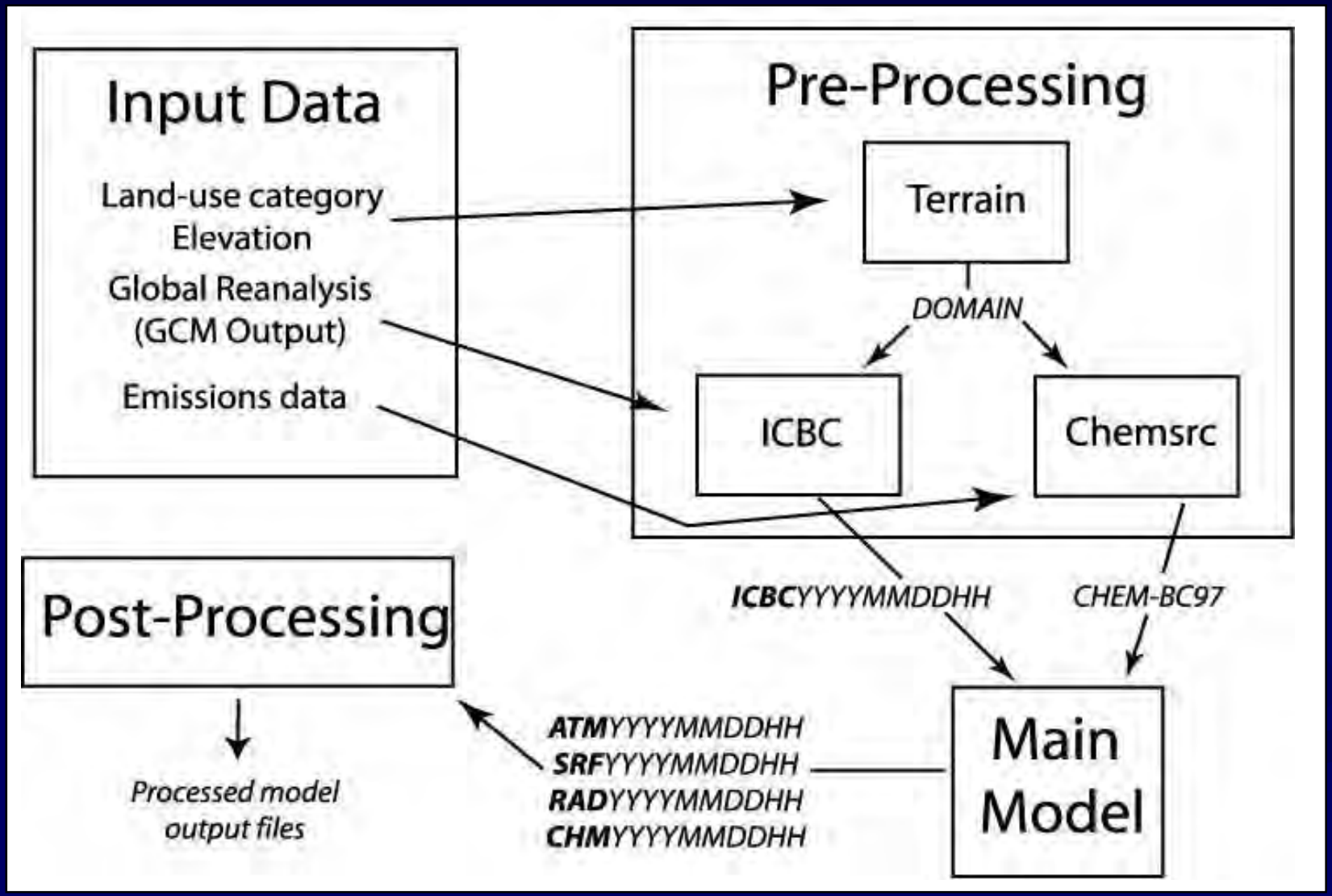
(zarrin et al., 2009)


Tropopause
Hadley cell
30°
0°

Methods and Materials

- Regional Climate Model (RegCM3)
  (Giorgi et al., 1993)
- NCEP Reanalysis Dataset
  (2.5 degrees Horizontal resolution)
- May-September (1990 and 1998)
- Control run and experimental run

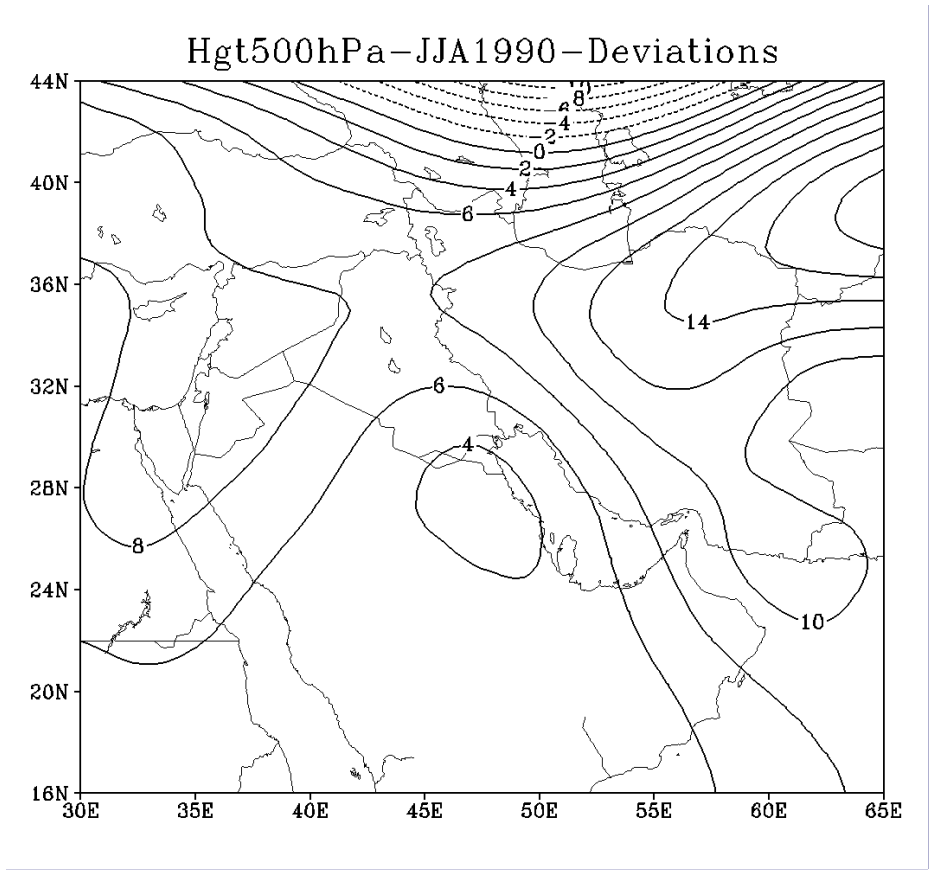
Regional Climate Model (RegCM3)



1990

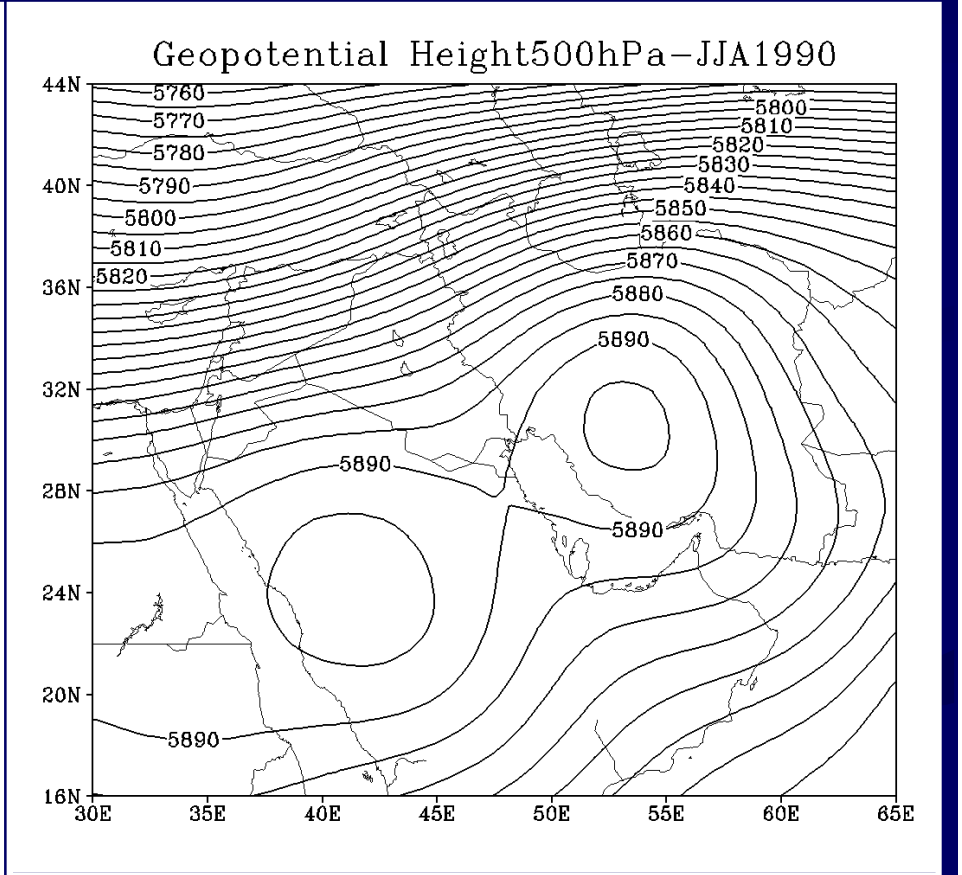
Mean Summer Geopotential Height Anomaly

500 hPa



Mean Summer Geopotential Height

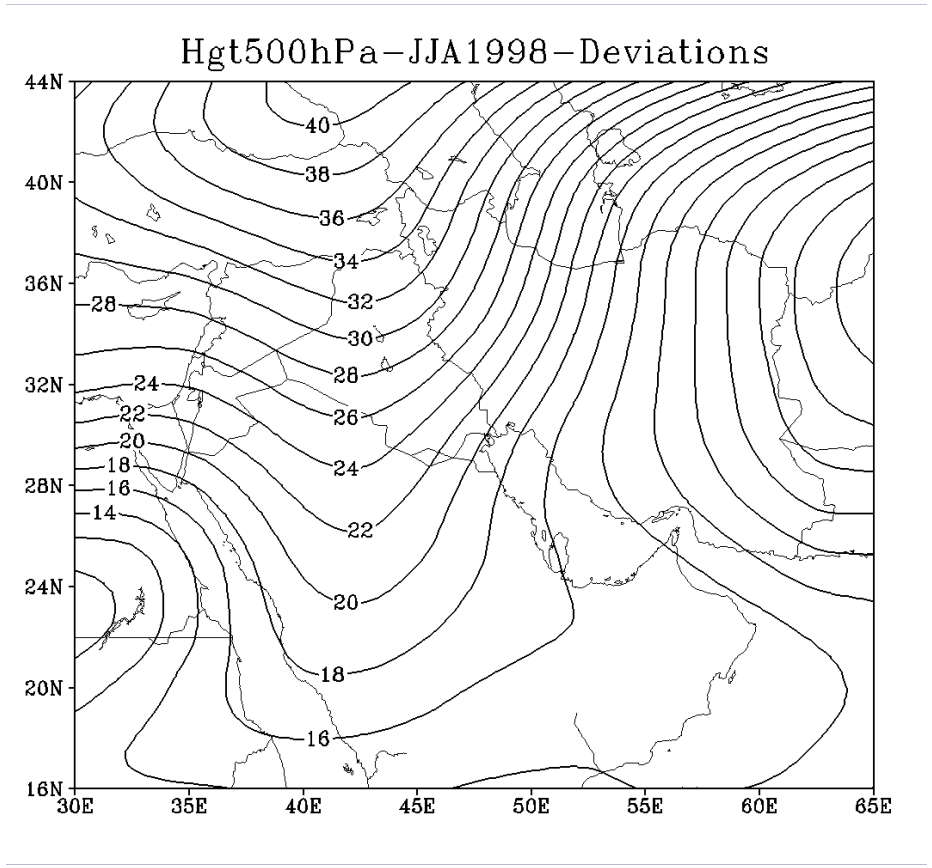
500 hPa



1998

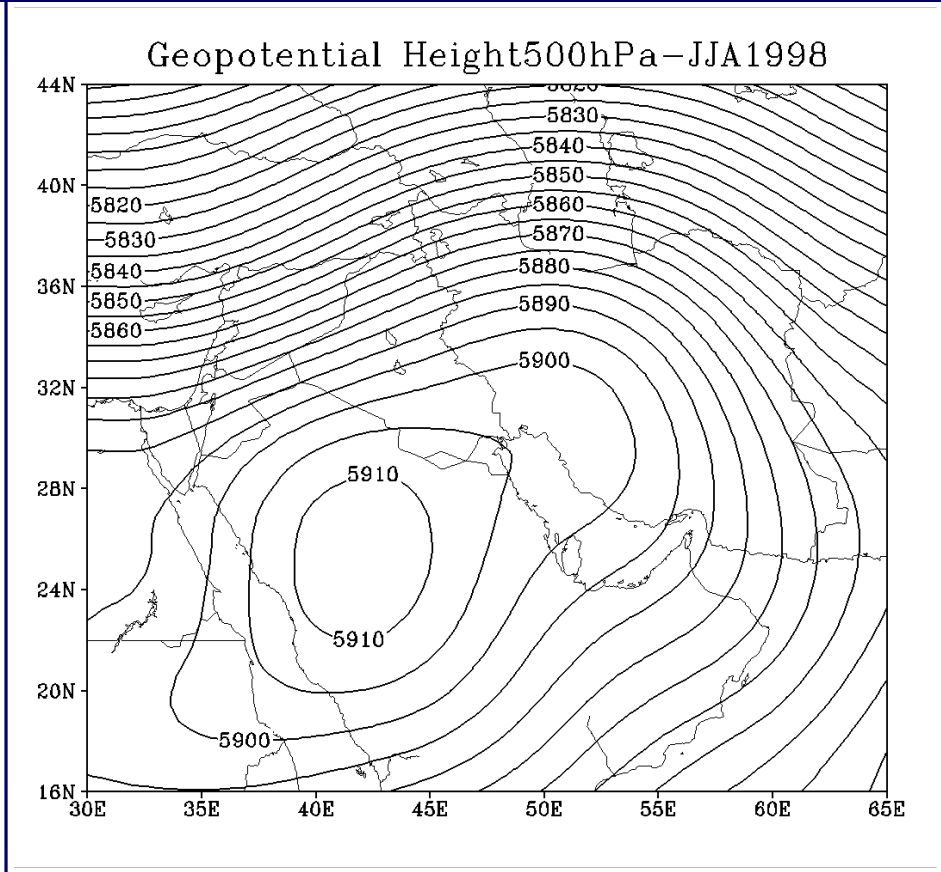
Mean Summer Geopotential Height Anomaly

500 hPa

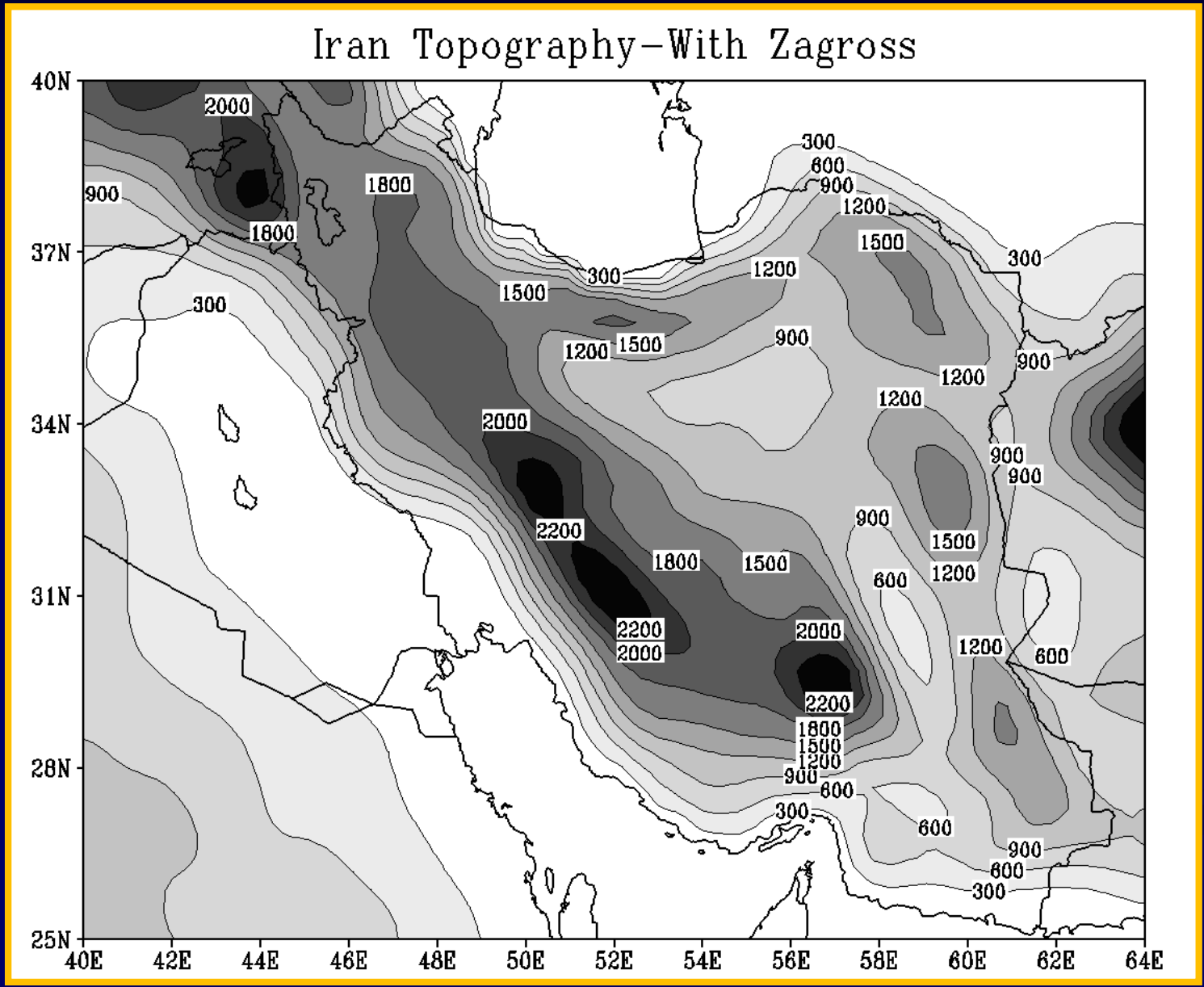


Mean Summer Geopotential Height

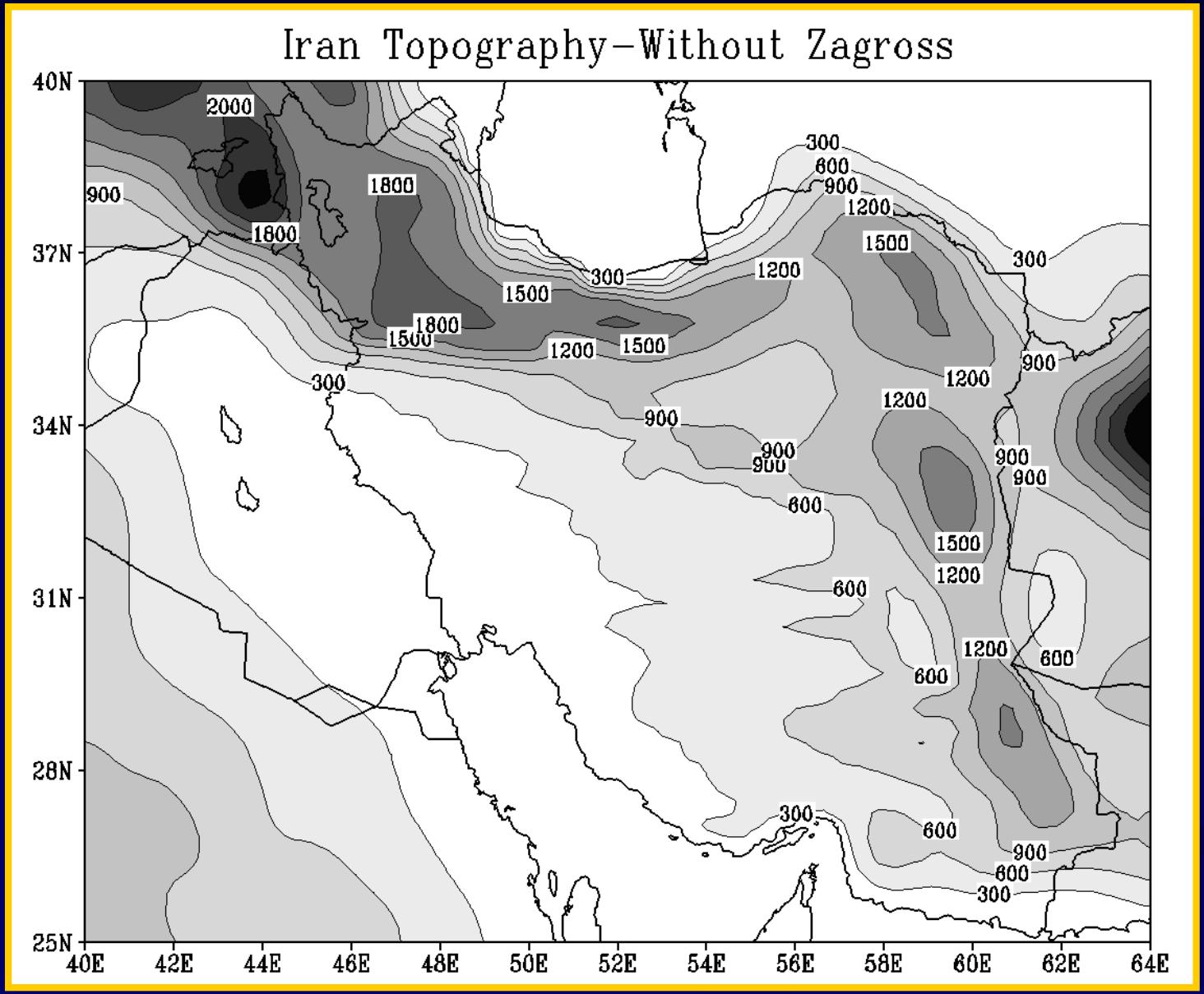
500 hPa



Domain Topography in Control Run



Domain Topography in Simulation Run



Vertical Velocity
Relative Vorticity: post-processing tools

Diabatic Heating

1

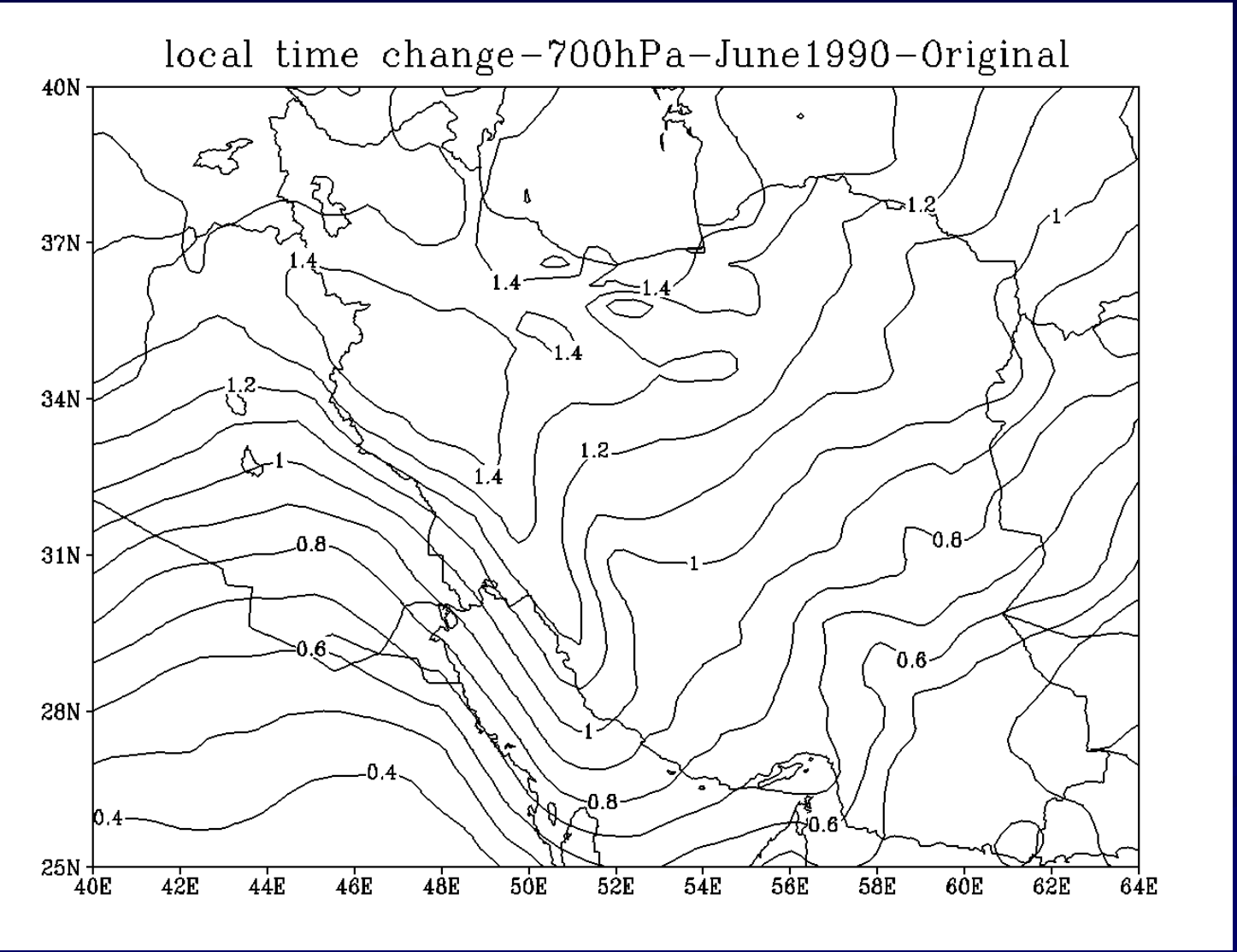
$$c_p \frac{\partial \theta}{\partial t} = -c_p . V . \nabla \theta + c_p \left(\frac{P}{P_0} \right)^k \frac{\partial \theta}{\partial P} \omega + Q$$

2

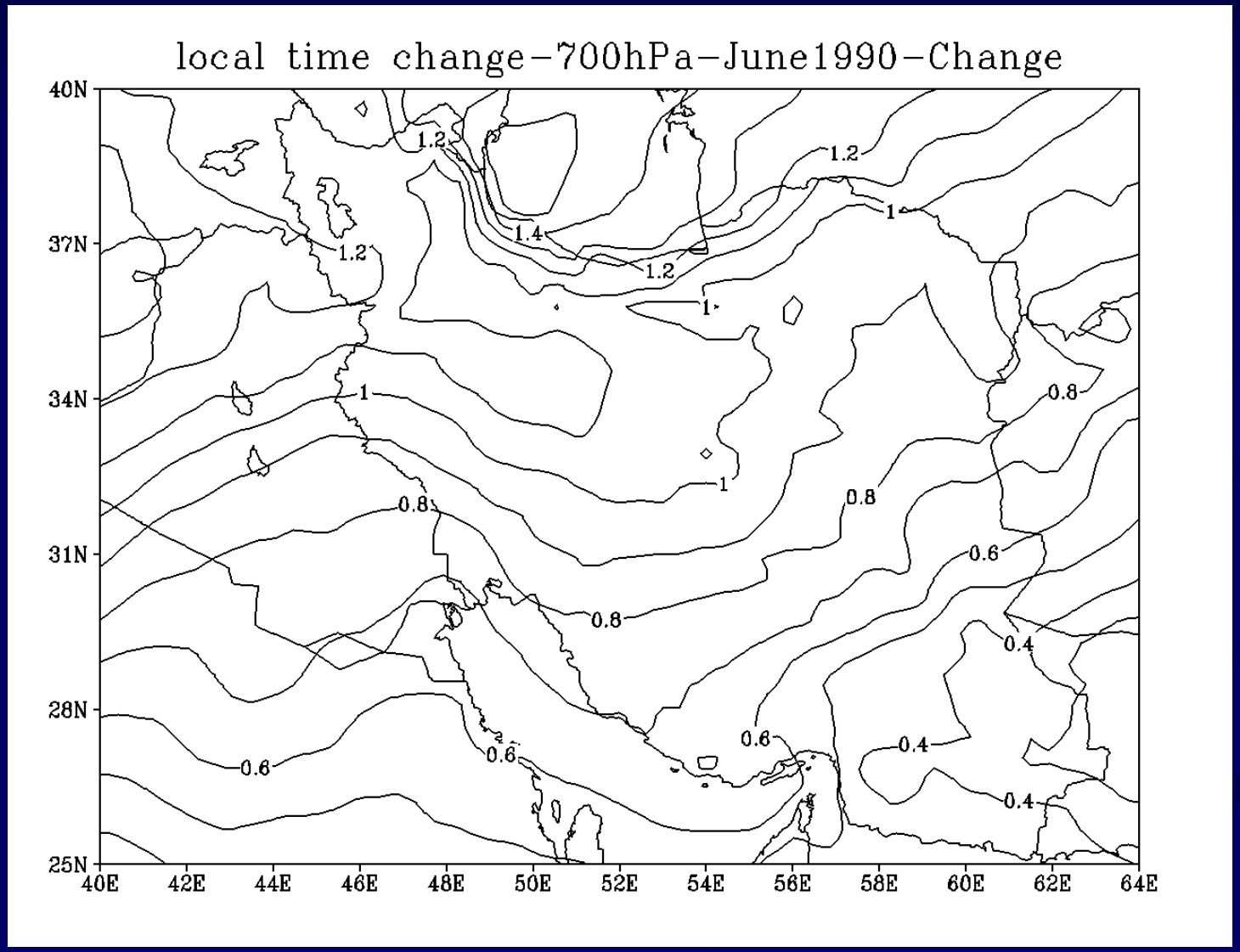
$$Q = c_p \left(\frac{p}{p_0} \right)^k \left(\frac{\partial \theta}{\partial t} + V . \nabla \theta - \omega \frac{\partial \theta}{\partial p} \right)$$

The Results

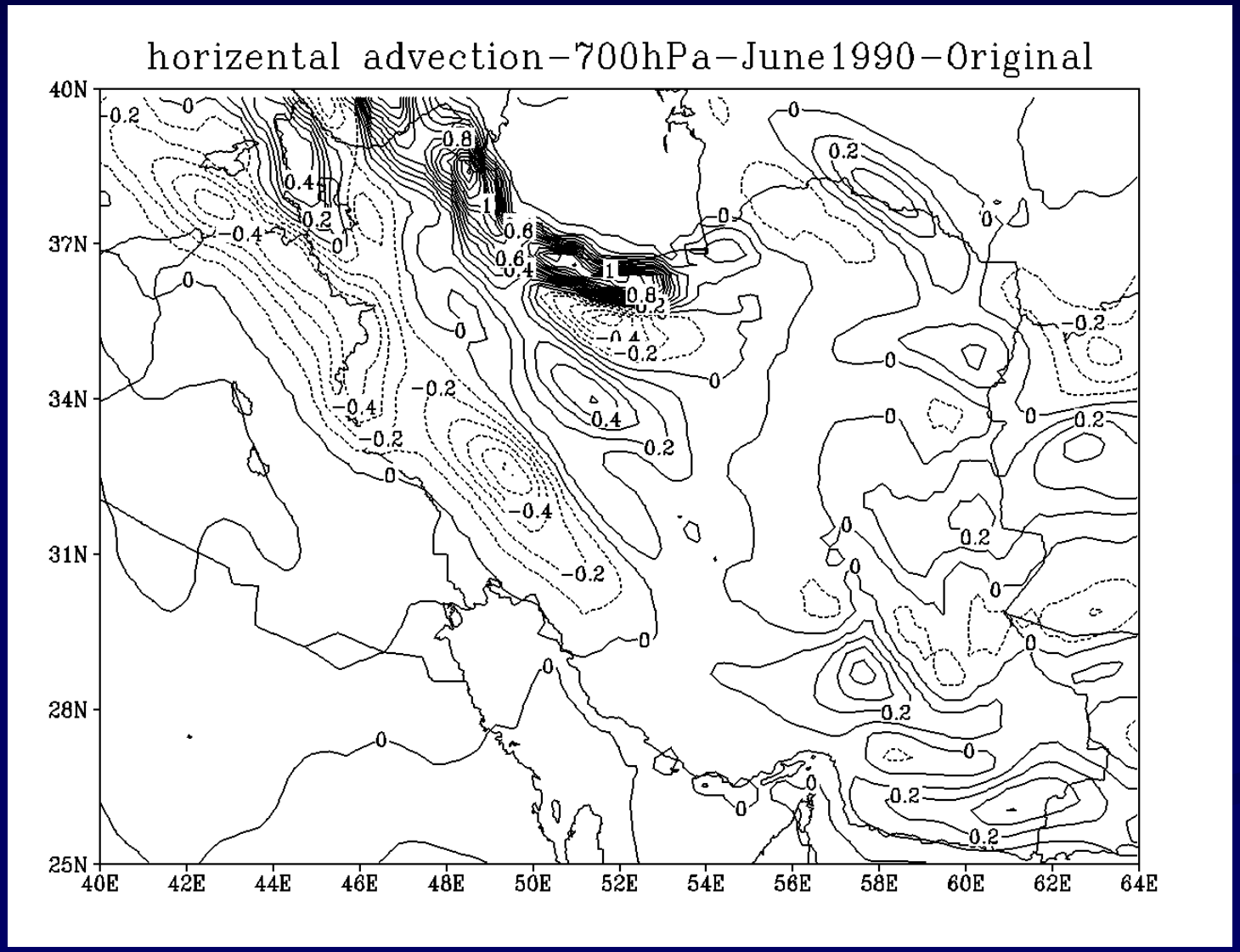
Local time change in Control Run



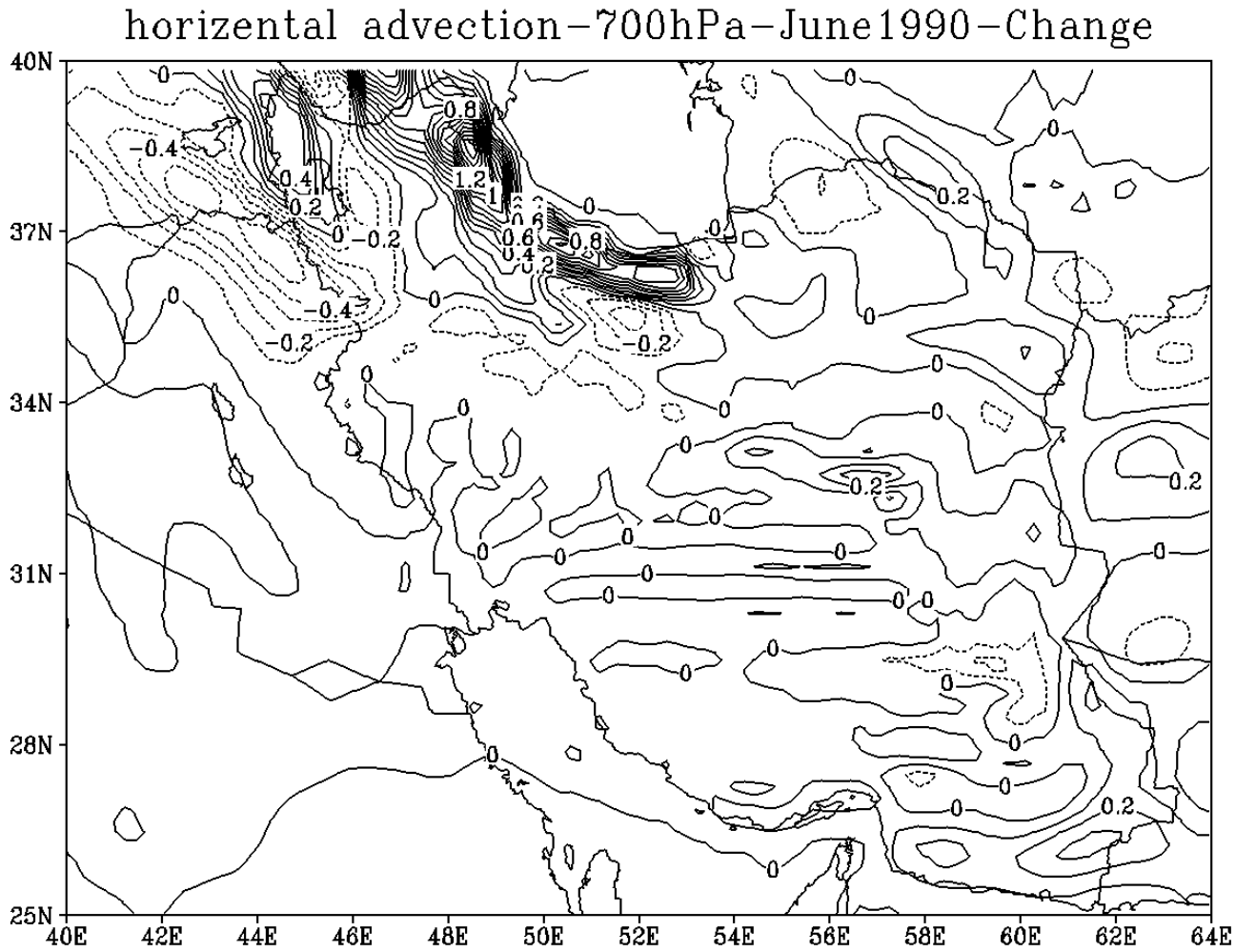
Local time change in Simulation



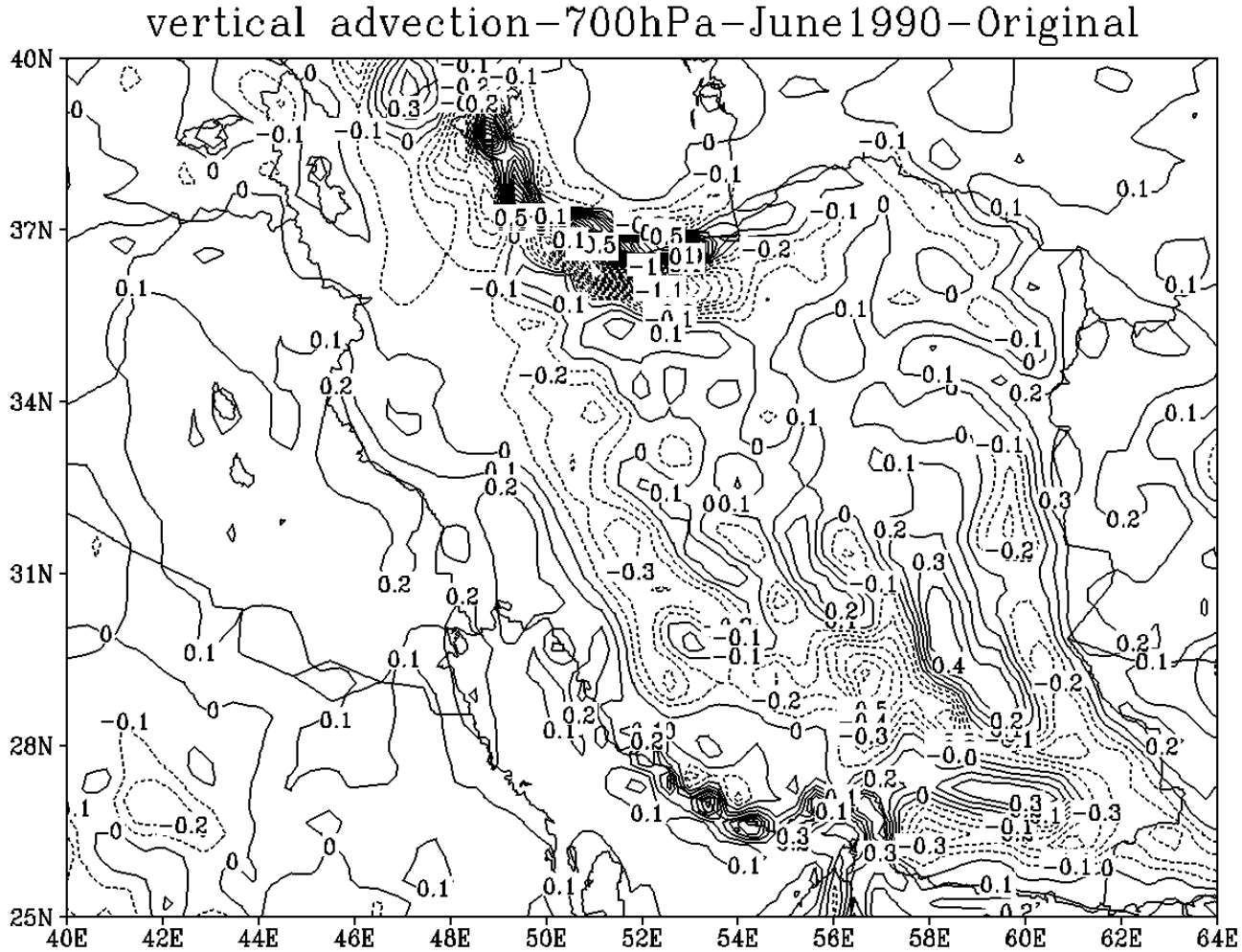
Horizontal advection in Control Run



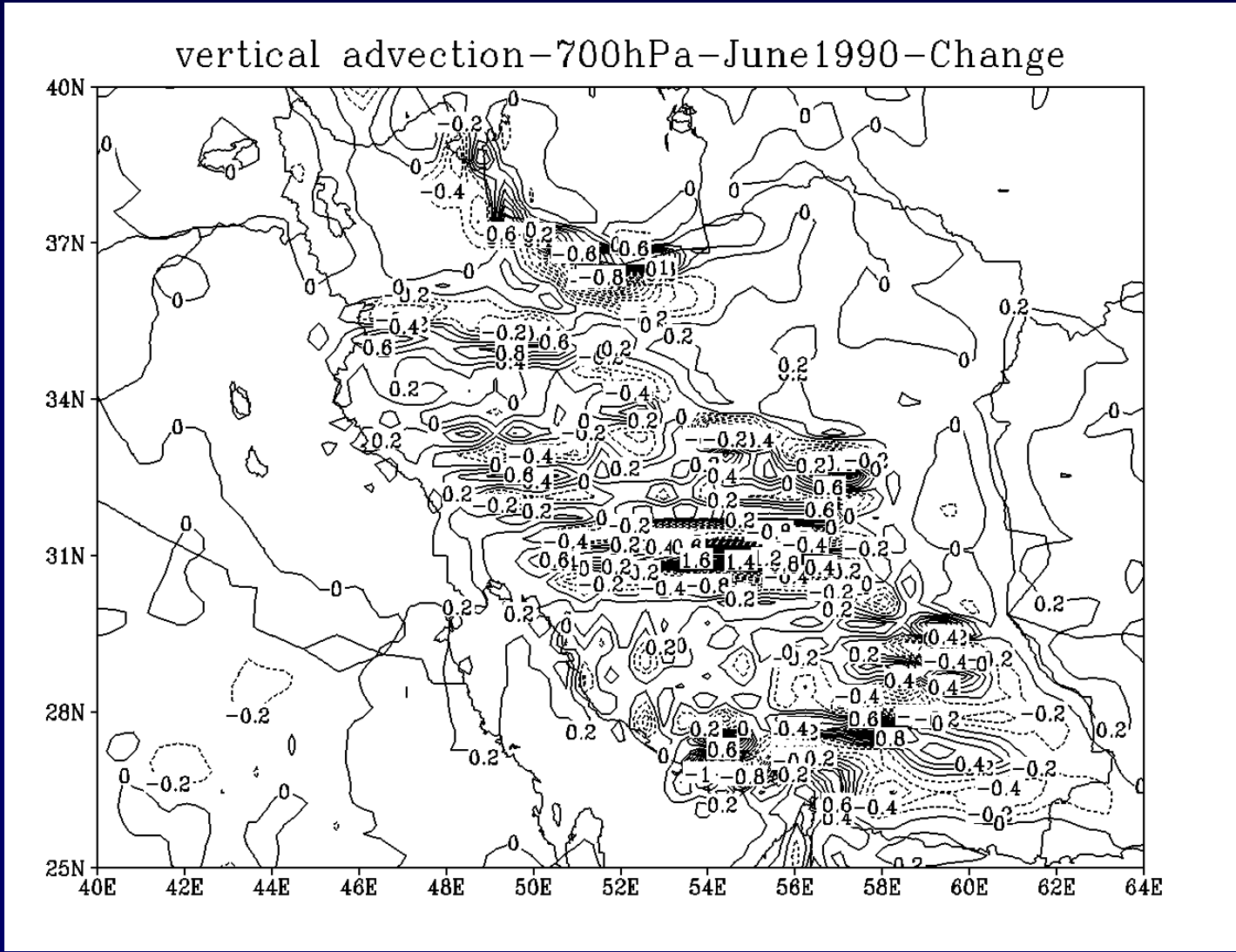
Horizontal advection in Simulation



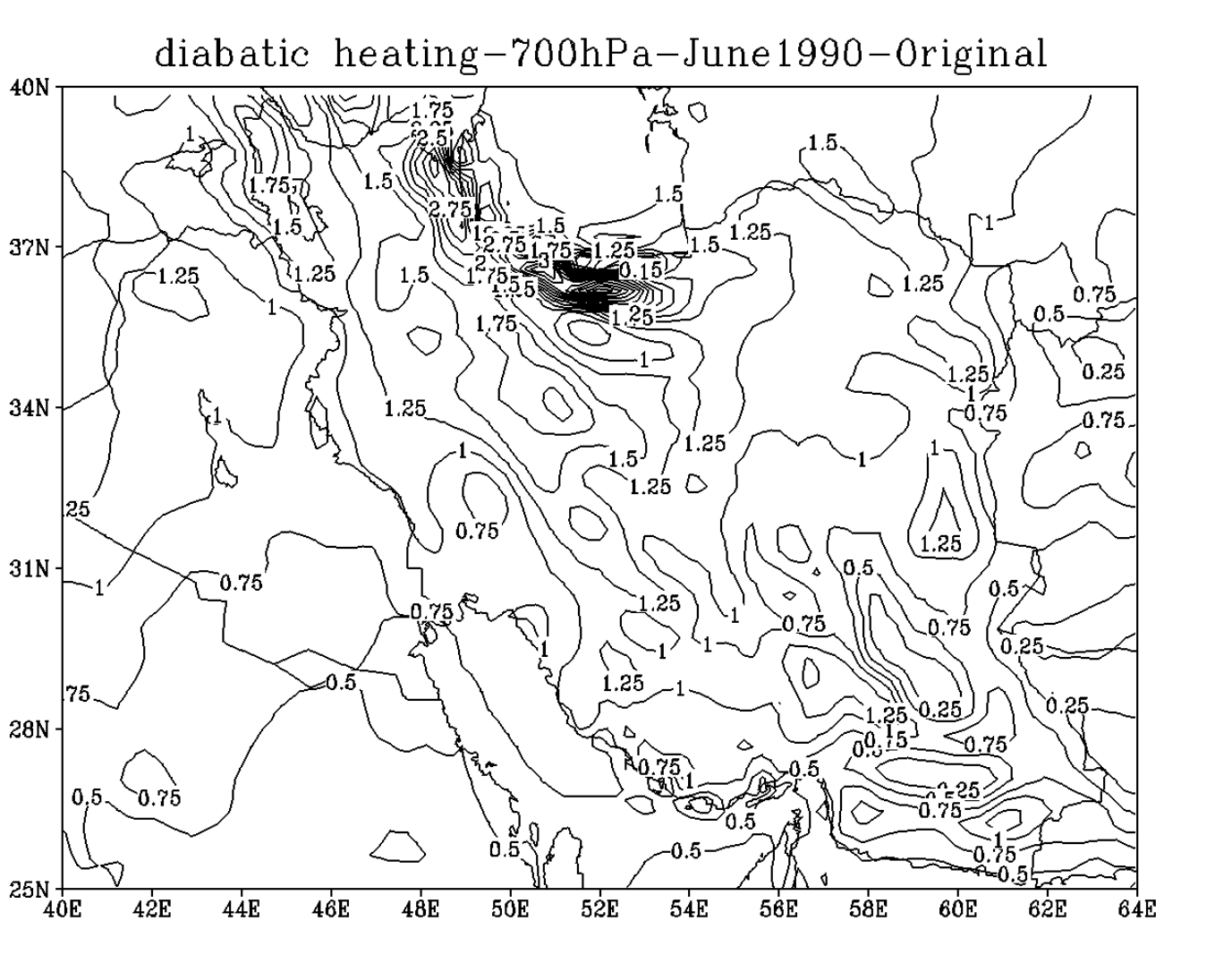
Vertical advection in Control Run



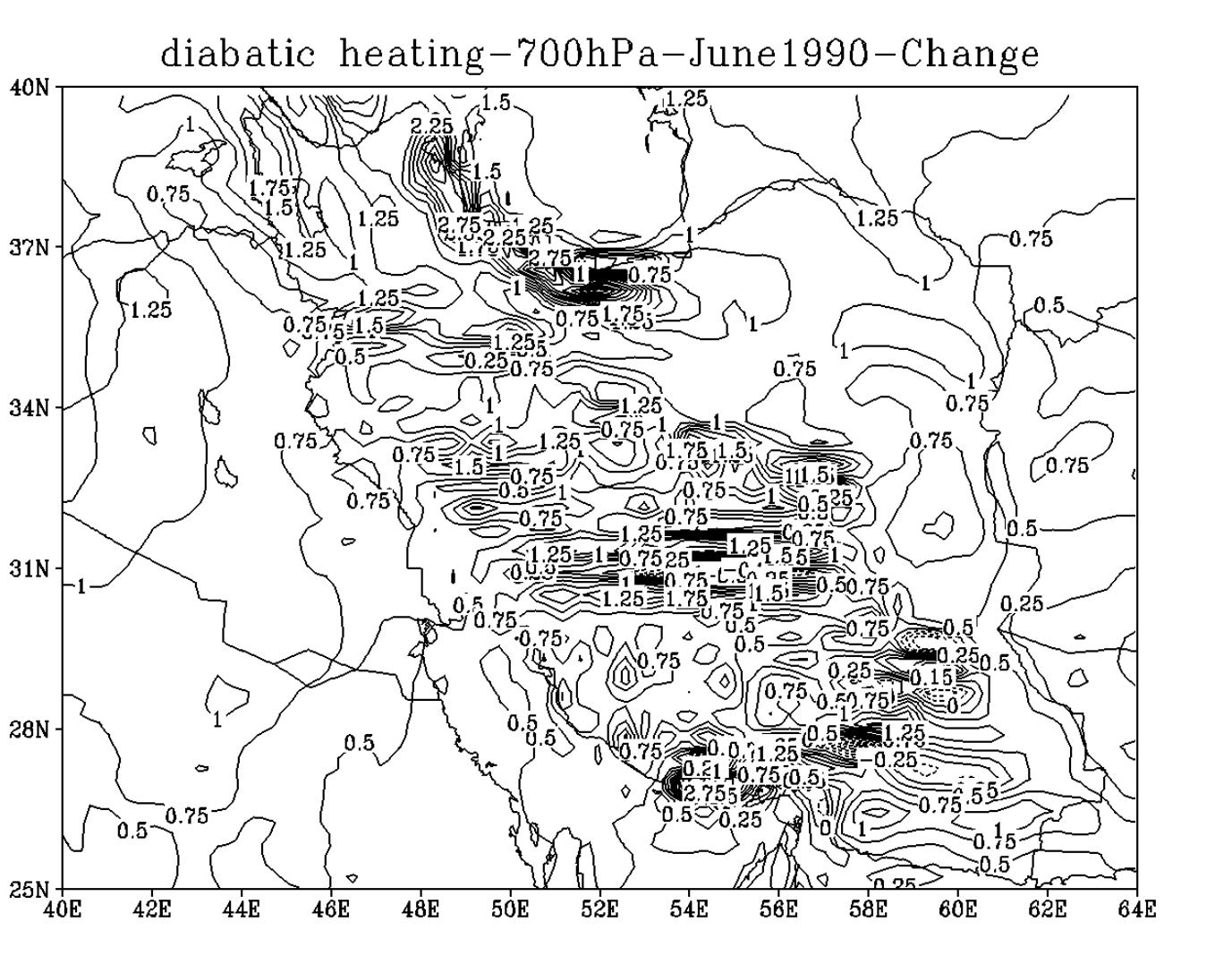
Vertical advection in Simulation



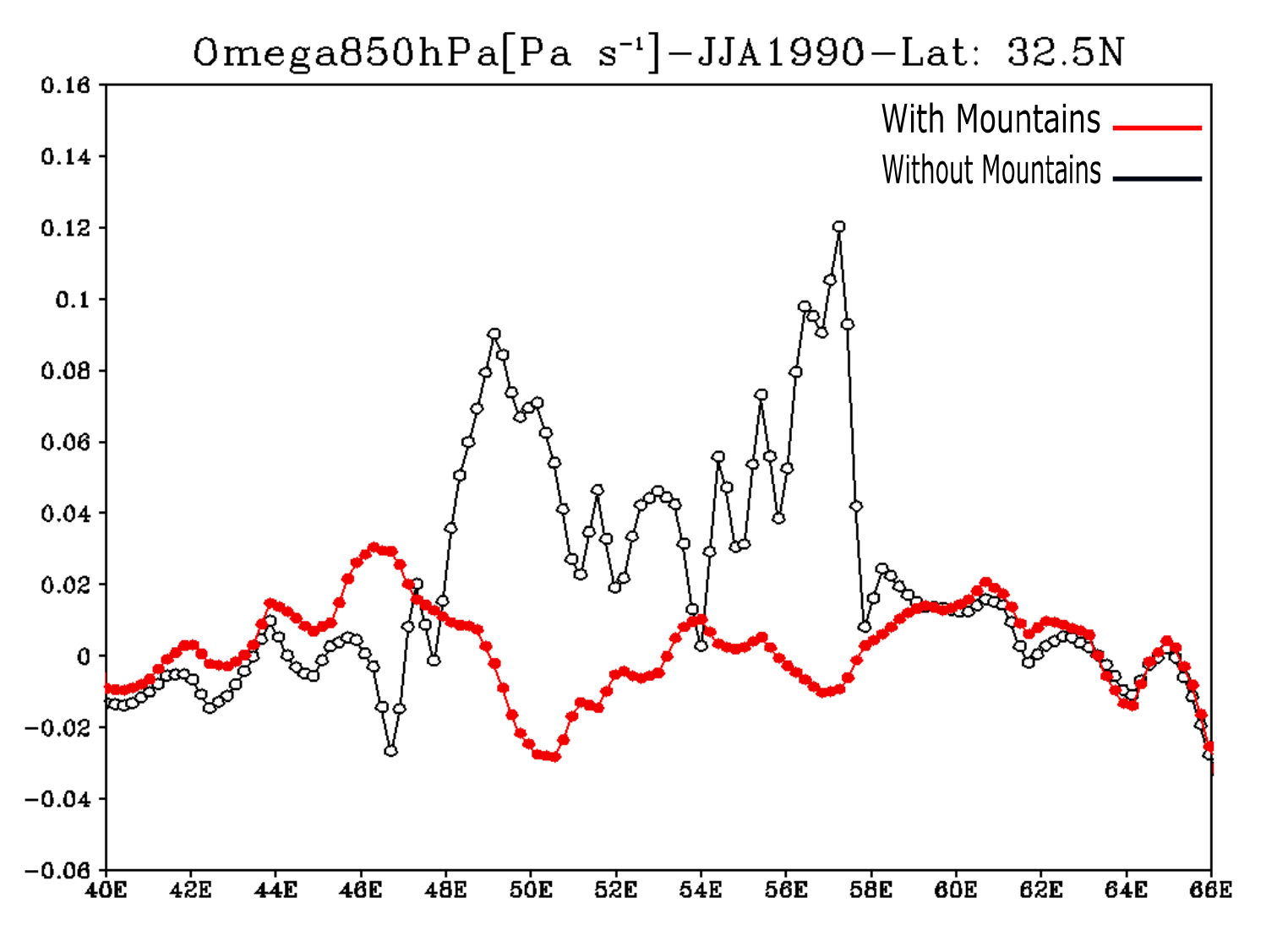
Diabatic heating in Control Run



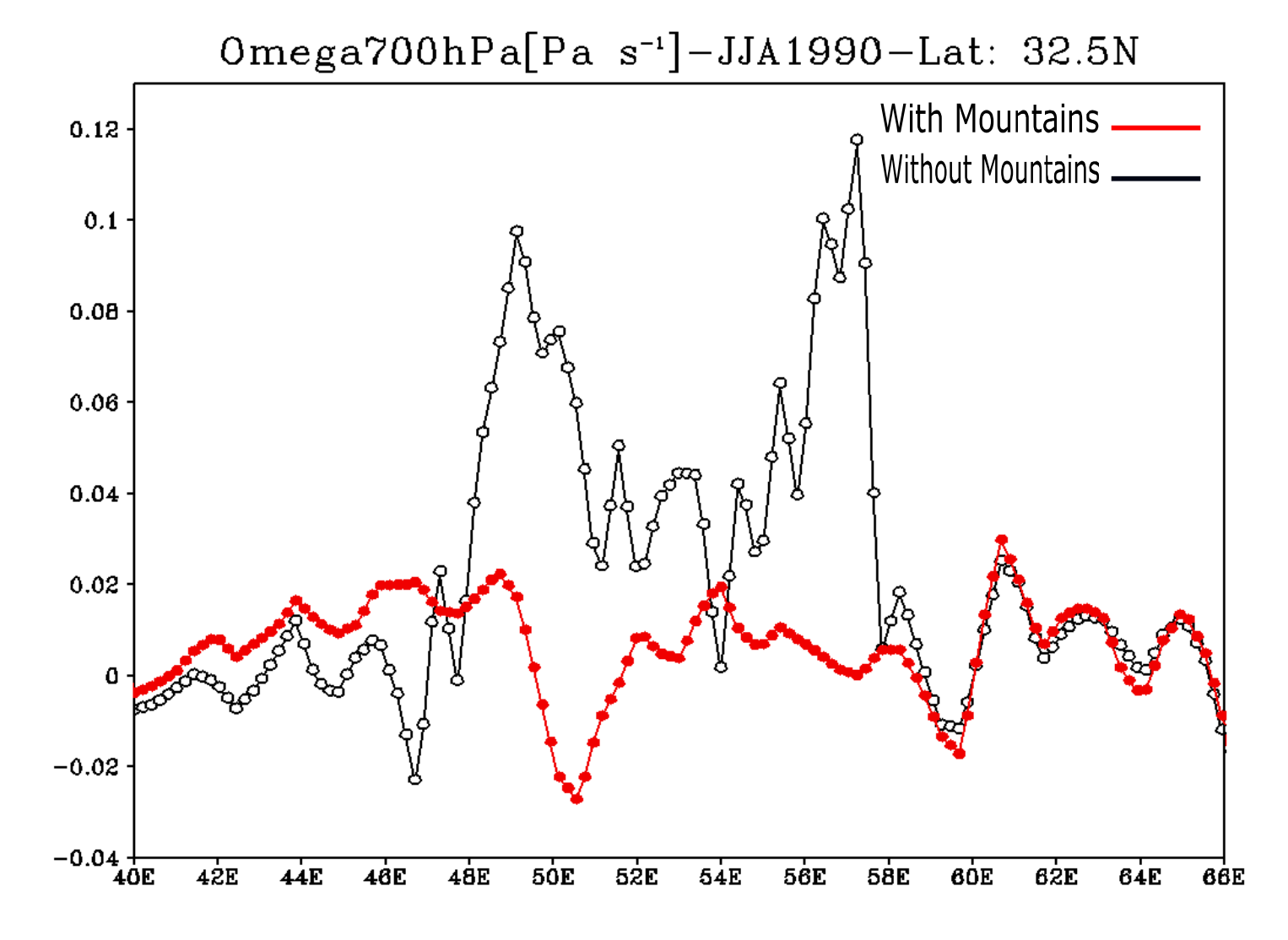
Diabatic heating in Simulation



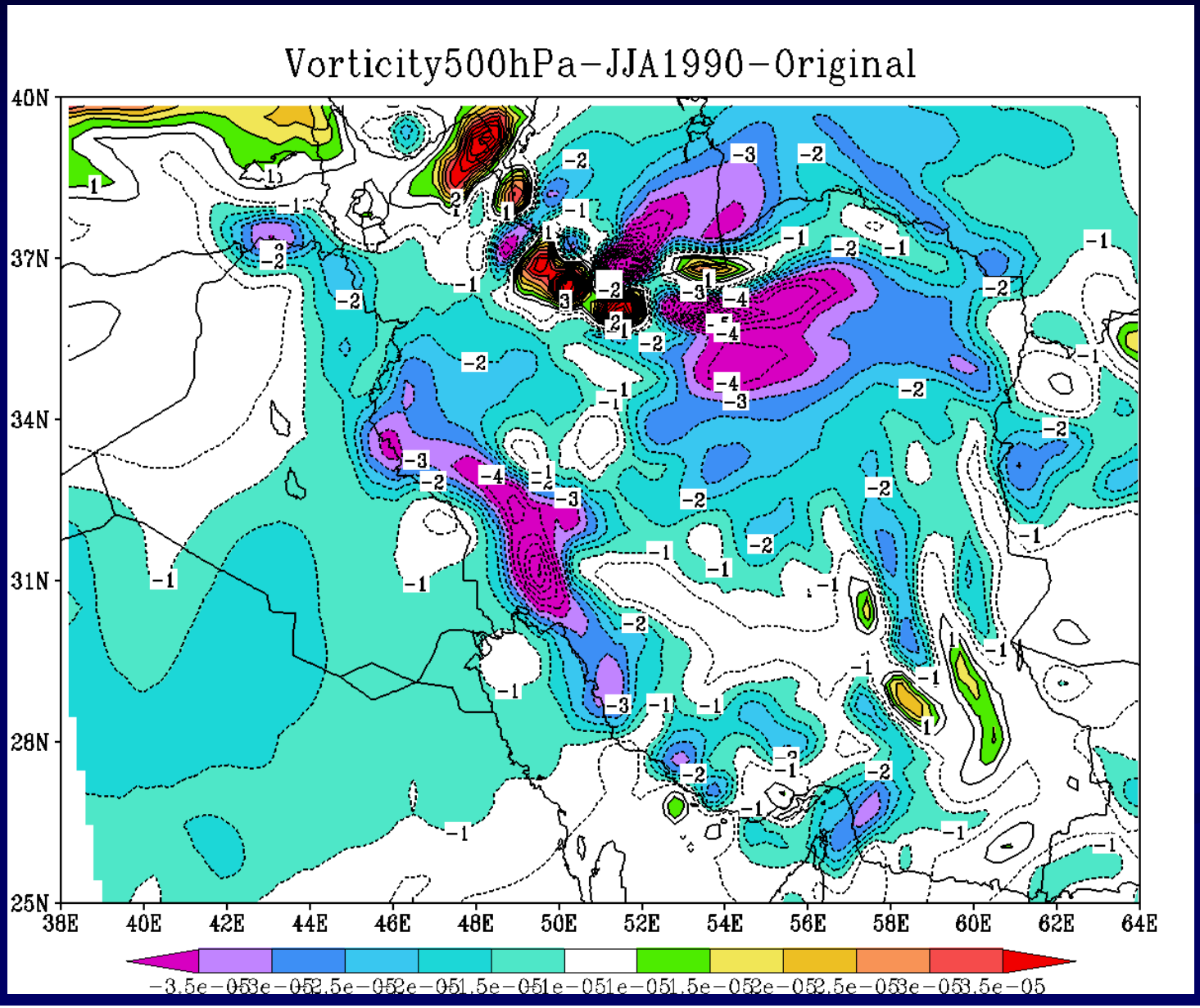
Vertical velocity in Control and Simulation Runs



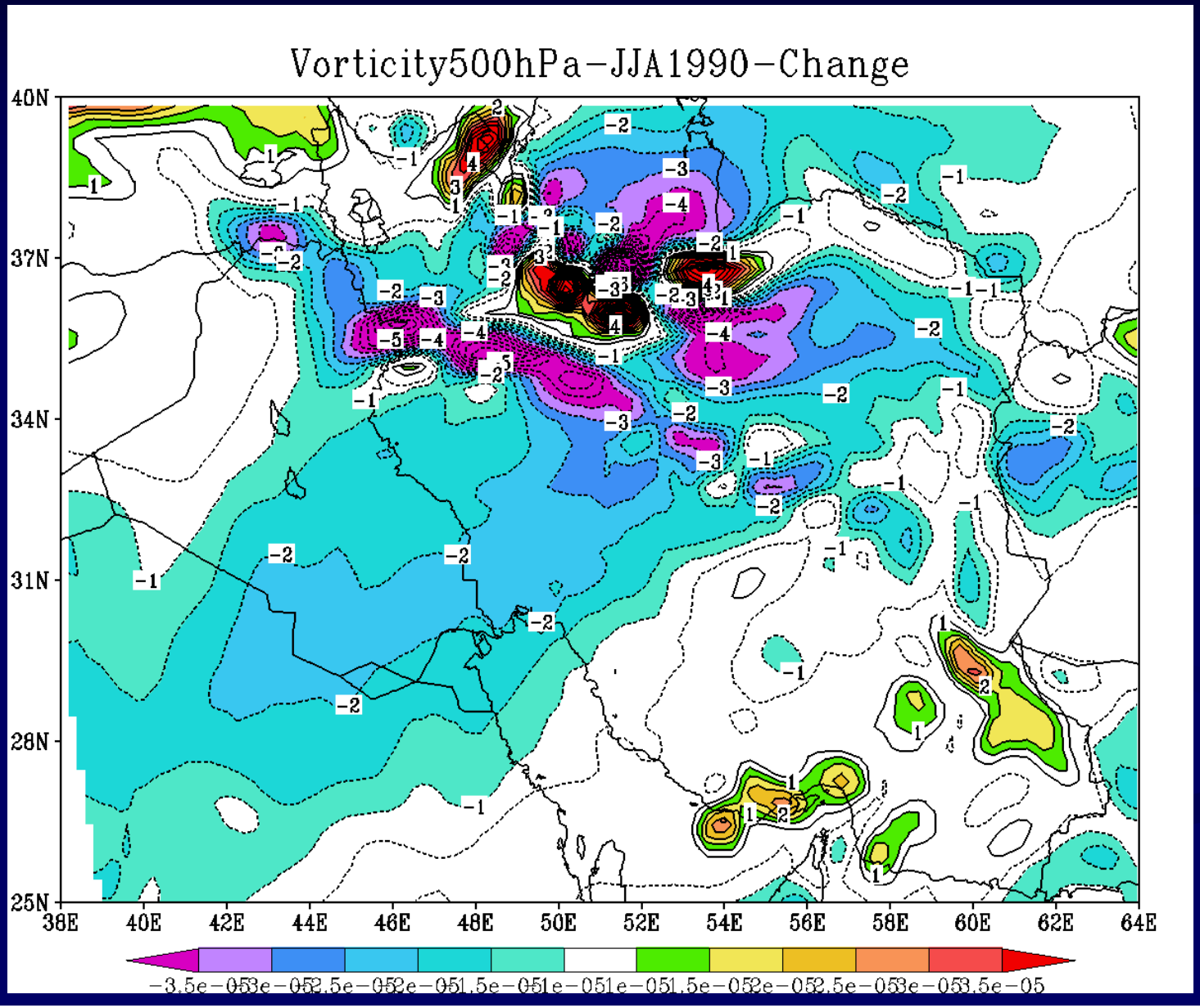
Vertical velocity in Control and Simulation Runs



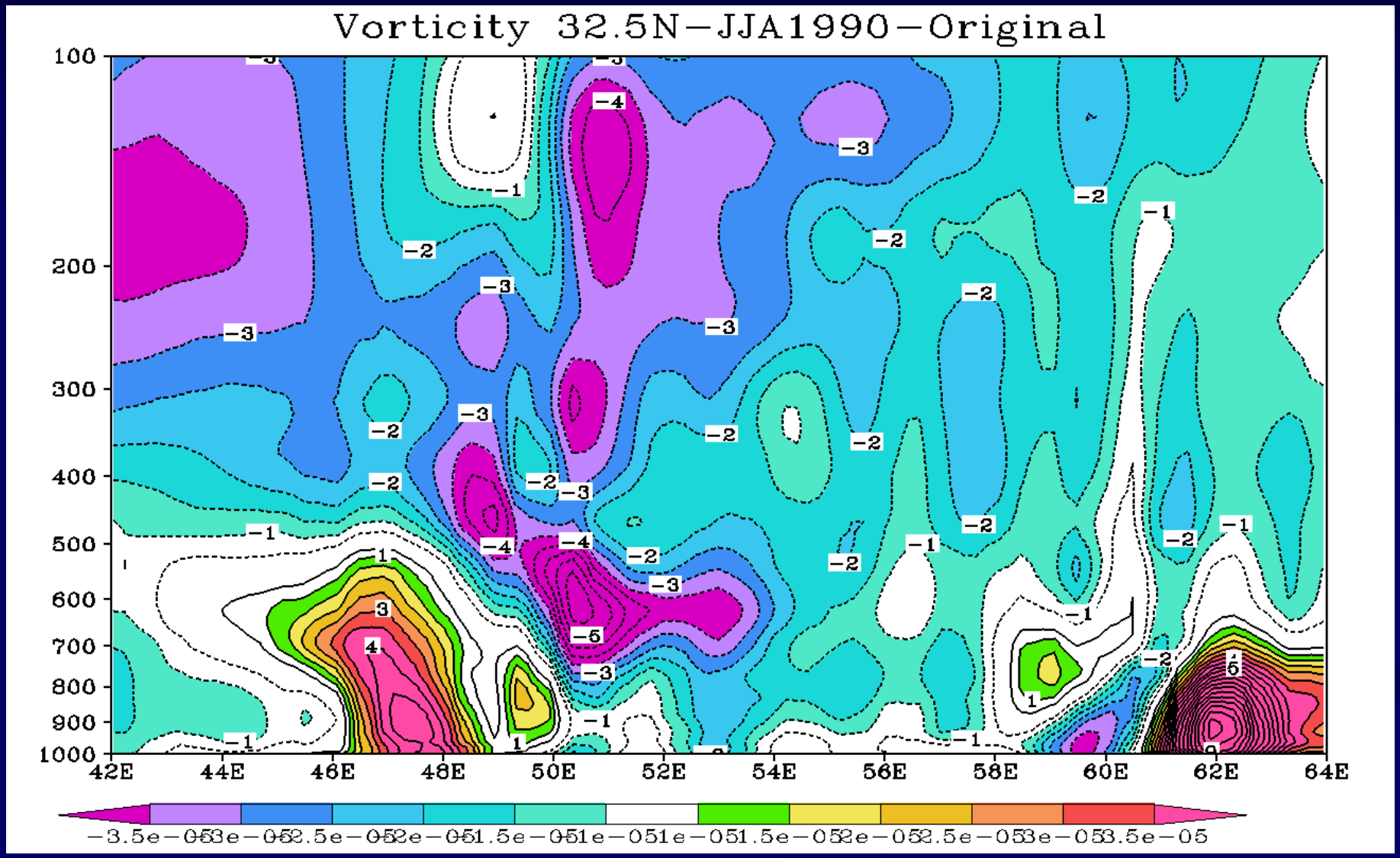
Mean summer relative vorticity in Control Run



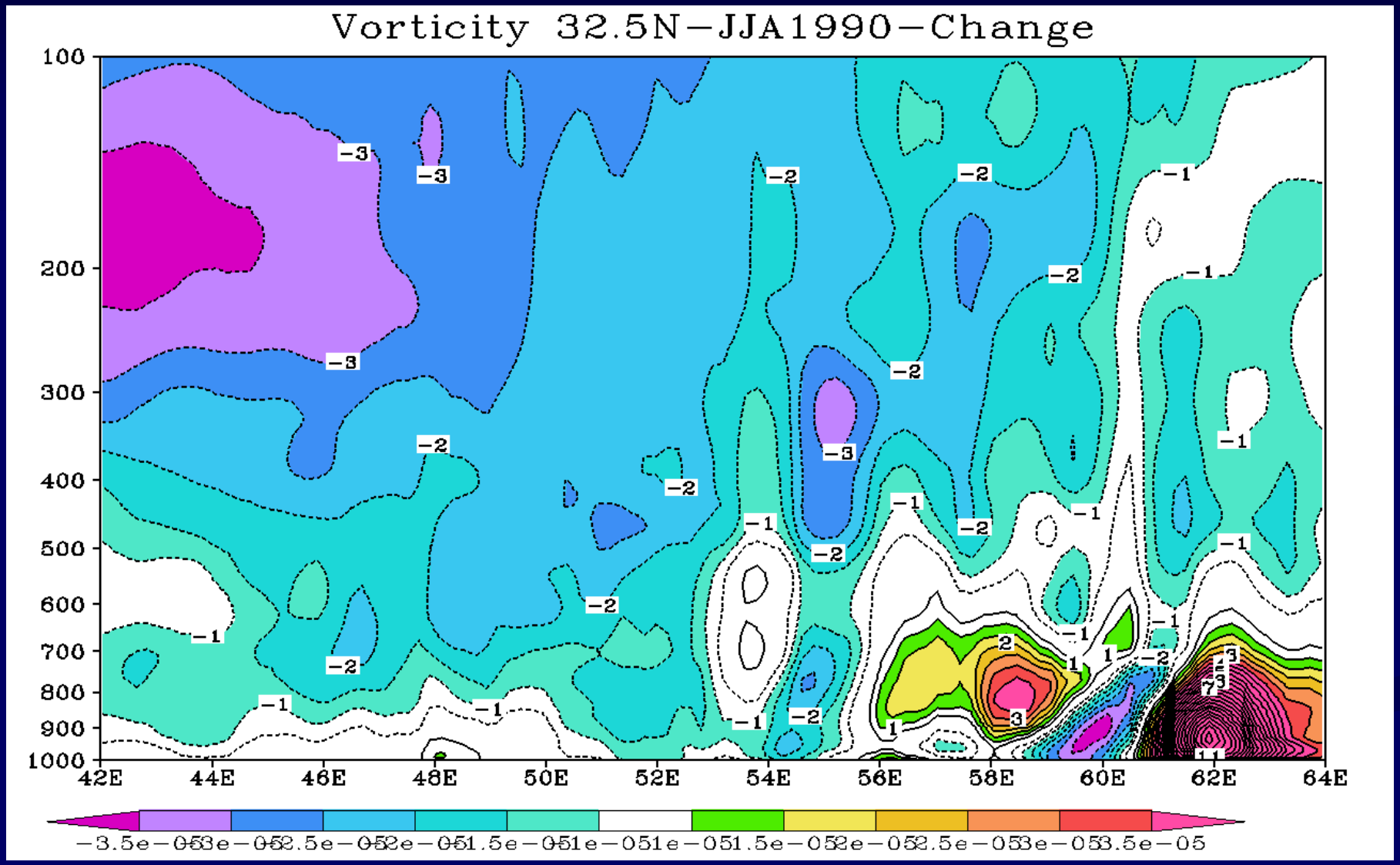
Mean summer relative vorticity in Simulation



Relative vorticity cross-section in Control Run



Relative vorticity cross-section in Simulation



Conclusion

- The diabatic heating values over the Zagros area deceases in simulation run.

- By removing the Zagros, upward vertical velocity over the Zagros area changes to downward motion. Also, the anticyclonic circulation of mid-level considerably decreases and the maximum negative vorticity over the Zagros area disappears. Even, cyclonic circulation of lower levels changes to anticyclonic circulation.

- The overall results indicate that Zagros Mountains as an elevated heat source plays an important role in the formation of Iran subtropical anticyclone.

Thank you for your attention!