Assessing diabatic signatures of upwelling near the tropical tropopause in reanalyses

Jonathon S. WRIGHT[1], Nuanliang ZHU[1], and Patrick MARTINEAU[2]

[1] *Tsinghua University, Beijing, China*

[2] *University of Tokyo, Tokyo, Japan*

Diabatic heating rates are important diagnostics of reanalysis behavior and performance. These heating rates are virtually impossible to measure directly and are therefore poorly constrained. The diabatic terms in reanalyses are influenced to some extent by the impacts of observational data assimilation on temperature, moisture, winds, and other variables, but still depend primarily on model parameterizations and are known to differ substantially among different reanalysis systems (e.g., Wright and Fueglistaler, 2013). The magnitude and distribution of diabatic heating within the tropical tropopause layer (TTL) provide valuable insight into the circulation of this region, and can help to diagnose the sources and characteristics of differences in this circulation amongst reanalyses. Here, we update and extend the intercomparison presented by Wright and Fueglistaler (2013) to include additional reanalyses over longer durations, a comparison of model-generated heating rates against heating rates diagnosed from the zonal-mean thermodynamic equation, and further analysis of the origins and impacts of key differences. We focus especially on the off-equatorial peaks in diabatic heating within the lower stratosphere, the magnitude and variability of heating at the base of the ascending branch of the Brewer–Dobson circulation, the level of zero net radiative heating near the base of the TTL, and co-variability among reanalysis cloud products and diabatic terms. Many results are based on a dataset of 6-hourly zonal-mean heating rates on pressure levels produced for the SPARC Reanalysis Intercomparison Project (S-RIP), available at http://catalogue.ceda.ac.uk/uuid/70146c789eda4296a3c3ab6706931d56.

Key words: diabatic heating, tropical tropopause layer, reanalysis, Brewer-Dobson circulation, S-RIP

References

Wright, J. S., and S. Fueglistaler, 2013: *Atmos. Chem. Phys.*, **13**, 9565-9576.