



Fountains and drains: What do we know about the heat balance of the Tropical Tropopause Layer?

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The transition region from troposphere to stratosphere in the tropics, also known as the Tropical Tropopause Layer, is of great importance to the climate system, most notably perhaps because it regulates tracer fluxes (in particular water vapour and Very Short Lived Substances, VSLS) into the stratosphere. A correct description of transport in the TTL, however, requires an accurate understanding of the heat budget - a delicate matter in a layer where the transition occurs from the thermally direct Hadley/Walker-cell to the thermally indirect Stratospheric Brewer-Dobson circulation. We discuss the heat balance based on (a) results from European Center for Medium-range Weather Forecast (ECMWF) reanalysis data, and (b) on radiative transfer calculations of clear and cloudy skies. We show that the heat balance - and hence the circulation - has distinct spatial (meridional and zonal), vertical, and temporal patterns, and compare these to existing theories of mechanisms driving the net ascent at low latitudes. We emphasize the need to improve the accuracy to which the terms of the heat balance are known in this layer before definitive conclusions on the physical processes governing its structure and circulation can be drawn.