



## **The Extratropical Tropopause Inversion Layer**

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The extratropical tropopause inversion layer (TIL) is studied by analyzing numerical simulations with a dry idealized global circulation model. The model temperature field is relaxed towards different restoration profiles. We demonstrate that in simulations with the Held and Suarez restoration profile, a TIL is present in the steady state, whereas for a different restoration profile no TIL arises. Neither restoration profile includes a TIL-like structure and if an enhancement in the static stability occurs, it is a result of the model dynamics. We consider the mechanisms by which the TIL forms following previous work in attributing the formation to the structure of the residual circulation, but by further examining the relation of the residual circulation to the structure of the Eliassen-Palm flux convergence using the downward control principle. The presence of two separate regions of convergence of the Eliassen-Palm flux, one in the troposphere and the other in the stratosphere, is found to be necessary to the formation of the TIL. We also discuss the relations to other theories that emphasize the role of vertical gradients in radiatively active species.