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# Stratosphere-Troposphere Coupling in Climate and Circulation Changes: How the Tail Wags the Dog

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Observed tropospheric circulation patterns are observed to have been shifting since the mid-20th century. Anthropogenic forcing of the earth system due to increases in greenhouse gases and halogens is thought to be the major cause of such a shift, which is reproduced in models. The ultimate cause of the shifting tropospheric circulation is due to processes in the Upper Troposphere and Lower Stratosphere (UTLS) and stratosphere-troposphere coupling. Examples from recent work and analysis of Chemistry Climate Model experiments will be shown. Ultimately, changes in the UTLS thermal structure due to increasing greenhouse gases and ozone depletion alter lower-stratospheric winds and tropopause thermal structure. This appears to be responsible for changes in the tropospheric storm tracks (near surface winds) as well as changes in the stratospheric overturning (Brewer-Dobson) circulation. The alteration of the storm tracks not only affects the distribution of surface climates (such as precipitation patterns), but also may affect the relative balance of cloud dynamical regions that control cloud radiative feedbacks, and ultimately affect climate sensitivity and the global energy balance. The UTLS region and stratosphere-troposphere coupling are thus critical for predicting the future state of the atmosphere, and may provide additional constraints on future climate scenarios and feedbacks. Results of simulations for the past and projections for the 21st century will be shown.