



## **How does stratospheric variability affect surface weather and climate?**

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Changes to the stratosphere, due to both natural variability and ozone depletion, have substantial effects on surface weather and climate, especially at middle to high latitudes. Despite clear evidence of these impacts, the primary dynamics of this phenomenon are not yet well understood. Here we show that the stratospheric meridional circulation forces the column of air above the Arctic downwards into the troposphere, acting like a mechanical plunger that controls the day-to-day thickness of the troposphere. This vertical motion directly affects temperatures and the strength of jets in the mid- to upper troposphere. Raising and lowering of the Arctic tropopause layer leads to stretching and compression of the tropospheric column and a north-south dipole in surface pressure similar to the Northern Annular Mode.