RESEARCH SPOTLIGHT

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Stratospheric ozone affects mesospheric temperature trends

Since 1961, temperatures in the summer mesosphere have undergone a series of reversals. From 1961 to 1979 the atmospheric layer that stretches from roughly 50- to 100-kilometer altitude cooled by 0.5 K per decade. In the subsequent 2 decades the rate of cooling escalated to –3 to –5 K per decade, while the next 10 years saw a mild recovery. Though these temperature flips are seen in the observational record, they have never been reliably re-created in computer models of the middle atmosphere. Unlike the troposphere or stratosphere, for which there are extensive records, observations of mesospheric temperature are limited to point-source detections, making accurate modeling particularly important.

Using an updated version of the Leibniz Institute Middle Atmosphere Model (LIMA), *Berger and Lübken* successfully simulated the recent temperature anomalies while also isolating the likely driver of the swings. Relying on stratospheric temperature and wind patterns, measures of incoming solar radiation, and records of stratospheric carbon dioxide and ozone, LIMA mirrored the decadal-scale mesosphere temperature anomalies seen in the observational record. Further, by fixing the simulated concentrations of ozone, or of ozone and carbon dioxide, the authors found that changes in stratospheric ozone explained a majority of the mesospheric temperature variability. Given the authors' findings, determining the sensitivity of mesospheric temperature to varying ozone and carbon dioxide concentrations will be important in coming decades as stratospheric ozone rebounds and carbon dioxide continues to climb. (*Geophysical Research Letters*, doi:10.1029/2011GL049528, 2011) —CS