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A new dynamical proxy representing short-term equatorial ozone and temperature variability

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Reliable estimates of long-term stratospheric ozone trends are important to quantify the impacts of climate change and the Montreal protocol efficiency. To make an accurate assessment using multi-linear regression, all modes of variability need to be well understood. Prior to 1998, upper stratospheric equatorial ozone showed a decline. While it appears to be increasing since then, the uncertainty on the trend, related to internal variability, still makes any firm conclusions difficult.

We have found short, sharp synchronized ozone and temperature changes in the equatorial stratosphere lasting just a few weeks, which are related to changes in the meridional circulation apparently initiated by perturbations in the mid-latitudes. The identification of this mode of variability in stratospheric temperature and ozone has allowed us to develop a new proxy that partially accounts for internal variability of the system. This proxy will lead to an improvement in ozone trend estimates, driving down the uncertainty above 10 hPa by up to 30%.