Interannual variability of the vertical descent rate in the Antarctic polar vortex

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To estimate a descent rate in the Antarctic polar vortex, we analyze the long-lived gas data derived from the HALOE on board the UARS for the 6 year period 1992 to 1997. Comparing methane profiles between the Antarctic fall and spring, we calculated the lower stratospheric descent for each of the 6 winters. It shows large year-to-year variations (1.8-1.2 km/month).

Downward and poleward movements of the westerly jet in the upper stratosphere during the mid-winter occur earlier in years with a large descent rate than small rate. The early movement brings an early enhancement of wave activity and it remains until late winter resulting from wave-mean flow interaction. As a result, a descent rate is larger when planetary wave amplitude is larger over the winter season.