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Normal mode Rossby waves and their effects on chemical composition in the late summer stratosphere

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Abstract. During past MANTRA campaigns, ground-based measurements of several long-lived chemical species have revealed quasi-periodic fluctuations on time scales of several days. These fluctuations could confound efforts to detect long-term trends from MANTRA, and need to be understood and accounted for. Using the Canadian Middle Atmosphere Model, we investigate the role of dynamical variability in the late summer stratosphere due to normal mode Rossby waves and the impact of this variability on fluctuations in chemical species. Zonal wavenumber 1, westward travelling waves are considered with average periods of 5, 10 and 16 days. Time-lagged correlations between the temperature and nitrous oxide, methane and ozone fields are calculated in order to assess the possible impact of these waves on the chemical species. Using Fourier-wavelet decomposition and correlating the fluctuations between the temperature and chemical fields, we determine that variations in the chemical species are well-correlated with the 5- and 10-day waves between 30 and 60 km, although the nature of the correlations depend strongly on altitude. Interannual variability of the waves is also examined.

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