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Planetary wave activity in the polar lower stratosphere

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Abstract. Temperature data from the COSMIC GPS-RO satellite constellation are used to study the distribution and variability of planetary wave activity in the low to mid- stratosphere (15–40 km) of the Arctic and Antarctic from September 2006 until March 2009. Stationary waves are separated from travelling waves and their amplitudes, periods and small-scale vertical distribution then examined. COSMIC observed short lived (less than two weeks and less than 5 km vertically) but large enhancements in planetary wave amplitudes occurring regularly throughout all winters in both hemispheres. In contrast to recent Arctic winters, eastward wave activity during 2008–2009 was significantly reduced during the early part of the winter and immediately prior to the major SSW. The eastward waves which did exist had similar periods to the two preceding winters (~16–20 days). A westward wave with zonal wavenumber two, with distinct peaks at 22 km and 35 km and period around 16–24 days, as well as a stationary wave two were associated with the 2009 major SSW. In the Southern Hemisphere, the height structure of planetary wave amplitudes also exhibited fluctuations on short time and vertical scales superimposed upon the broader seasonal cycle. Significant inter-annual variability in planetary wave amplitude and period are noticed, with the times of cessation of significant activity also varying.

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