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ICESTAR - INTERACTIONS BETWEEN PLANETARY WAVES AND TIDES IN THE ANTARCTIC MIDDLE ATMOSPHERE

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The international cooperation that makes Antarctica a continent for science has enabled observations of the Antarctic middle atmosphere that are not possible anywhere else on Earth. Atmospheric radars operated by Australia (Davis), Japan (Syowa), the UK and the USA (Rothera) form a ring of observing sites at the same latitude that can track planetary-scale waves in the mesosphere and lower thermosphere (MLT, 70-100km) as they propagate around the planet. Interactions between atmospheric tides and longer-period waves yield variations in the MLT wind that have high spatial and temporal variability. This variability needs to be investigated if we are to understand the dynamics and chemistry of the MLT and represent it in numerical models.

The atmospheric tidal modes that are most efficiently forced by the absorption of solar radiation reach their maximum amplitudes at the same local (solar) time, independent of longitude. However, recent observations have shown that other tidal components are also present. Using the Antarctic radars, it is possible to separate the total tide into local-time locked (migrating) and non local-time locked (non-migrating) components. The variation of these tidal amplitudes can be used to identify and investigate interactions with other planetary waves.

Data obtained since 2002 show that the non-migrating content of atmospheric tides varies on a seasonal time scale as well as one consistent with modulation of the tides by long-period planetary waves. The tidal times of maximum also vary in a systematic way.

The relationship between the parameters obtained using the above techniques and the tidal and planetary waves themselves is considered and the results are interpreted. It is noted that modulations of tidal amplitude present in the non-migrating component differ somewhat from those in the total tidal amplitude. This suggests that the interactions being considered are possibly more common than would be inferred from the more usual single-station observations. The nature of the interaction between the tides and planetary waves and the atmospheric levels at which they are likely to occur are also considered.