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Winds and tides of the Antarctic mesosphere and lower thermosphere: One year of meteor-radar observations over Rothera (68°S, 68°W) and comparisons with WACCM and eCMAM

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Tides are crucially important to the dynamics of the MLT. Therefore, models which aim to span the whole atmosphere must be capable of reproducing these tides, making observations of tides vital to constrain model development. Here, we present a novel climatology of 12- and 24-hour tides, measured at heights of 80–100 km by a meteor radar over the Rothera Station, Antarctica (68°S, 68°W). We use these observations to test two GCMs: WACCM and eCMAM (the latter 24-hr only). Our observations reveal large-amplitude tides with strong seasonal variability. The 12-hour tide maximises around the equinoxes and the smaller-amplitude 24-hour tide maximises in summer. WACCM reproduces 12-hour tidal amplitudes at 80 km well, but not their increase with height or equinoctial maxima, and reproduces the observed small variation in 24-hr tidal amplitude with height well but with anomalously-large amplitudes. eCMAM reproduces observed 24-hr tidal amplitudes and their small variation with height. Our observations also reveal sizeable day-to-day variability in tidal amplitude at planetary wave periods, which we suggest originates from non-linear tidal/planetary-wave coupling. Furthermore, we see notable differences between observed and model background winds which are not reproduced in the models; we propose these differences may arise from the lack of in-situ gravity-wave sources in the models.