Non-Gaussian Sea Surface Slope Statistics Observed During SOWEX

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The Southern Ocean Waves Experiment (SOWEX) was conducted in June 1992 (Banner et al., *J. Phys. Oceanog.*, **29**, 2130-2145, 1999; Chen et al., *J. Phys. Oceanog.*, **31**, 174-198, 2001). Backscattered power data at 36 GHz, registered to ocean wave topography, were acquired southwest of Tasmania with the NASA Scanning Radar Altimeter (SRA) (Walsh et al., *J. Geophys. Res.*, **103**, 12,587-12,601, 1998) under a wide range of wind and sea conditions, from quiescent to gale force winds with 9 m wave height. The collection altitude varied from 35 m to 1.4 km, allowing determination of the sea surface mean squared slope (mss), the directional wave spectrum, and mss variation with respect to wind and wave parameters.

Under light wind conditions at low altitude, the reflection of the aircraft, silhouetted against the bright sky, intermittently appeared in the downlooking video, providing a graphic demonstration of the two-scale nature of the scattering. The image was still distorted by surface gravity waves on the order of 10 m, but a simulation of the scattering indicated that the high-contrast nature of the image demonstrated that the contribution to the mss by waves in the typically dominant gravity-capillary region was only about 0.00003, two orders of magnitude below the Cox and Munk (*J. Mar. Res.*, **13**, 198-227, 1954) minimum value of 0.003. As the windspeed at 35 m height fluctuated between 2 and 5 m/s, the aircraft image fluctuated between high contrast and totally faded out.

The non-Gaussian sea surface slope statistics observed by the SRA over the range of sea states agree well with the theoretical developments of other investigators and a simple model to fit them has been developed.

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