Spectral form and source balance of short gravity waves

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We investigated the spectral structure and source balance of short gravity waves, based on in situ observations of wavenumber spectra retrieved by air-sea interaction spar (ASIS) buoys. The behaviors of wavenumber spectra up to 10 rad/m (the gravity wave regime) were analyzed for a wide range of wind and wave conditions. The observed wavenumber spectra showed the spectral power laws described by Toba [1973] and Phillips [1958] in addition to the characteristic nodal point at ~10 rad/m. We also improved the third-generation wave model using the nonlinear dissipation term. The wave model reproduced the spectral form in the higher wavenumber domain. In the equilibrium range, nonlinear transfer played a major role in maintaining equilibrium conditions. On the other hand, in the saturation range, which starts at the upper limit of the equilibrium range, nonlinear transfer did not keep up with other source terms, and the dissipation term was in balance with wind input.