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The "shallow-waterness" of the wave climate in European coastal regions

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This short MS considers the extent to which waves around European coastal regions can be considered as 'shallow-water' i.e. where the wave circulation reaches to and is influenced by the sea-floor rather than 'deep-water' i.e. the vertical scale of the wave circulation is smaller than the sea depth. The approach taken here is to analyze waves in the ECMWF ERA-Interim coupled atmosphere-wave-ocean reanalysis. The criterion for 'shallow-waterness' is taken to be $n = c_g/c_p$, the ratio of the group velocity c_g to the phase velocity c_p ; which is 0.5 for extreme deep-water waves and 1 for extreme, non-dispersive, shallow water waves where the ocean depth is much less than the vertical scale of decay k^{-1} of the orbital motion, where k is the wavenumber of the wave. For a given value of $n = n_c$ the key diagnostic is then the fraction of the wave energy in the part of the wave spectrum with $c_g/c_p \geq n_c$ i.e. wavelengths longer than the wavelength which gives $c_g/c_p = n_c$.

The authors then consider the field of this shallow-water energy fraction for four different values of n_c ranging from 0.55 to 0.85. Values are largest in winter and even then generally low except in the North Sea (particularly the southern part) and parts of the Arctic and Mediterranean shelves. A clear seasonal cycle (low fraction in summer, higher fraction in winter) is evident in the simulations at six coastal stations. There is considerable atmospherically-driven high frequency temporal variability in the shallow-water energy fractions, with occasional high values happening at times with a wide range of significant wave height.

General comments

The analysis set out here is very clear, and even though the MS is short and simple, the results are interesting. However, the authors need to be more explicit as to why the shallow-waterness is important, and what different values of n_c imply. With the current MS, it is unclear why any of the four values of n_c are important. Presumably the appropriate value of the shallow-waterness parameter n_c depends on the application (bottom mixing, surge prediction etc) —this needs to be discussed. Also, the authors need to justify why they chose to couch

their cutoff criterion in terms of $n = c_g / c_p$ rather than something simpler e.g. the orbital motion at the bottom relative to that at the surface, or even simply kh.

Recommendation

The manuscript is fundamentally publishable, but requires more discussion of the implications of different values of n_c.