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Wind sea and swell waves in the Baltic Sea

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Ocean surface gravity waves (henceforth simply called waves) are the most obvious phenomena of the air-sea interaction, and a detailed understanding of the wave mechanics and wave climate is important from an engineering and scientific point of view. Waves have a considerable impact on coastal and offshore infrastructures and offshore operations, and are determinant on ship design and routing, but waves also play an important role on the coastal dynamics and beach erosion, and modulate the exchanges of momentum, and mass and other scalars between the atmosphere and the ocean.
There are two types of waves at the ocean surface: wind sea waves, generated locally and strongly correlated to the local wind, and swell waves, generated remotely and propagated away from their generation area. Since swell waves can propagate long distances across the globe (Alves 2006), in the open ocean the wave field is always the result of the contribution from waves with different frequencies and directions, reflecting different origins.
The most important wave parameters are the significant wave height (SHS) and the mean wave period (MWP). Nevertheless these two parameters allow only a limited description of the wave field characteristics. Since they are calculated by integrating the wave spectra, two wave fields with the same SWH and MWP may still be different in detail. A more detailed investigation and qualitative analysis is therefore needed to correctly define a wave field characteristics and climate. The way to assess to pursuit this analysis is by studying the wind sea and swell parameters separately.
A recent study from Semedo et al. (2011) on the wind sea and swell global climates, using the ERA-40 wave reanalysis from the ECMWF (European Centre for Medium-Range Weather Forecasts) added a qualitative perspective of the global wave field characteristics, and concluded that the open ocean surface wave field is most of the times dominated by swell waves. Since the aim of this study was to give a perspective of the global wind sea and swell climate and variability, regional wave features, particularly close to coast or within marginal seas, are not well represented, due to the coarse resolution of the reanalysis but also to the fact that ERA-40 wave data was produced for deep waters, without the bottom friction and refraction mode.
This study presents a detailed climatology of wind sea and swell waves in the
Baltic Sea based on the high resolution reanalysis NORA10, developed by the Norwegian Meteorological Institute (Reistad et al. 2011). The spatial patterns of the swell and wind sea regional wave fields are shown to be completely different from the open ocean, mainly due to the reduced fetch dimensions.

References:

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