

On discriminating swell and wind-driven seas in Voluntary Observing Ship (VOS) data

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The global visual wave observations (VOS) are re-analyzed within the theoretical concept of self-similar wind-driven seas (Badulin et al. 2005, 2007, Gagnaire-Renou et al. 2011). The theoretical criteria of discriminating wind-driven and swell seas are formulated and shown to be adequate to the problem. The results are detailed for the South Pacifica which wave climatology based on VOS data is well studied (Gulev, Grigorieva, Sterl, and Woolf 2003, Gulev and Grigorieva 2006) and the swell component is well pronounced.

The core of the analysis is one-parametric dependencies wave height - wave period. Theoretically, wind-driven seas are governed by the power-like laws with exponents close to Toba's one $3/2$ while the corresponding swell exponent ($-1/2$) has an opposite signature. This simple criterium was used and appeared to be robust for the problem of swell-wind sea discrimination. This discrimination does not follow exactly the VOS data. This important issue is considered both in the context of methodology of obtaining VOS data and within the physics of the mixed sea.

Prospects of further study are discussed. In particular, satellite data are seen to be promising for tracking ocean swell and for studies of physical mechanisms of its evolution.

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