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Effect of sea wave age on scatterometer measurements and wind speed retrieval accuracy

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Radiolocation data is widely used for the wind field retrieval over the sea surface.
Wind speed is obtained from the radar cross-section. The backscattered signal contains information about the sea surface but not about the wind vector. This means that at the fixed wind speed the radar backscattering cross-section (RCS) depends on the sea maturity.
In the present work the influence of the sea state at RCS and wind speed retrieval accuracy was investigated. The collocated array of ERS scatterometer and sea buoys data was processed. Buoy data were used to determine the wave age and all the dataset was separated into three parts: developing wind waves, fully developed waves and mixed sea.
It was shown that error of wind retrieval algorithms for scatterometers (CMOD in this case) depends on the sea state. Wind speed is overestimated for swell-dominant sea and underestimated for developing waves.
The direct problem of RCS dependence on the wind vector and sea state was also concidered. The large-scale waves slope variance is a very important parameter that implicitly influences the RCS in case of Bragg scattering and depends on the sea state. The buoy data were used to estimate the slope variance. The algorithm based on artificial neural networks taking into account the slope variance for RCS retrieval was proposed and performed better agreement with the measured RCS than CMOD5. It was shown that RCS increases with the slope variance growth other conditions being equal.
Thus wind speed retrieval accuracy can be increased by taking into account sea waves parameters and regional peculiarities.

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