

Synergetic use of scatterometer and synthetic aperture wind measurements in coastal areas

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Some remote sensing instruments give information about wind speed (and/or direction) offshore. These data are of great interest regarding the sparsity of in-situ wind measurements offshore. Scatterometers are able to give measurements of wind speed and direction at a spatial resolution of 25 km. These measurements are, however, associated to a low temporal resolution (2 measurements per day are available at the middle latitudes). In addition, scatterometers are not able to give reliable wind measurements near the coast (up to 25 km off the coast) because of the influence of the land backscatter. Synthetic aperture radars enable the retrieval of high spatial resolution wind measurements (at a resolution of ~ 1 km) and give measurements near the coast. However, these measurements are associated to low temporal resolution (only few measurements are available per month). We propose to benefit from the high temporal resolution of scatterometer measurements and from the high spatial resolution of synthetic aperture radar measurements. The idea behind the method is that if two wind fields are similar at low spatial resolution they will be similar at high spatial resolution. In other words, fine scale structures present in wind fields are driven by large scale structures. The method consists on a classification of wind fields available at high temporal resolution. This classification results on a limited number of typical situations. For each of these situations, we associate the corresponding high spatial resolution synthetic aperture radar measurements. Fine scale structures are extracted from these high spatial resolution measurements and injected in the low spatial resolution measurements using multi-scale analysis. Thus, we obtain a synthetic data set of wind fields allying the high temporal and high spatial resolution. We applied this method near of the coasts of Brittany, France. The results reveal that many fine scale structures are retrieved using this method.