FEASIBILITY ASSESSMENT OF SIMULTANEOUS OCEAN WIND AND CURRENT MEASUREMENTS

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The ESA DopScat project aims at assessing the potential of scatterometer instruments for simultaneous Ocean Vector Wind (OVW) and sea surface current retrievals. Existing scatterometer data are being used with new signal processing techniques to explore ocean surface motion retrievals. Based on this, an optimized scatterometer concept might be developed, maintaining OVW capability, but extended with Doppler shift estimation capability with sufficient accuracy for surface current estimation. Scatterometer Ocean Vector Wind (OVW) measurements are well established [Bourassa et al., 2009]. Using Doppler measurements, simultaneous determination of the motion vector of the ocean surface (OVM) may also be feasible in the same off-nadir measurement configuration. Sea surface current signature is one component of ocean surface motion. Several recent studies [Chapron et al.,2005; Johannessen et al., 2008; Collard et al., 2008] explore SAR Doppler velocity measurement in relation to sea state. Wind-generated and breaking roughness elements ride on larger and fast moving waves, which thus contribute strongly to the measured Doppler shift. The simultaneous measurement of OVW and OVM on a global scale may thus allow for the determination of open ocean currents and improved understanding of ocean waves, wave-current interaction and air-sea interaction. In SAR-based current estimation, sea state has been taken into account to provide quantitative measurements of sea surface current. We present how this sea state contribution can be removed to retrieve the sea surface current. This method has been applied to ASAR data to obtain sea surface currents which have been compared to surface current measurements derived from drifters. In addition, SAR Doppler shift and NRCS have been combined in a wind inversion scheme to get better winds in weak surface current areas. Some results obtained for complex meteorological situations such as atmospheric fronts or hurricanes will be shown. Finally, we discuss how we could combine these complementary approaches to get coincident wind and sea surface current from an optimized scatterometer instrument.