The Sea surface Kinematics Multiscale monitoring (SKIM) proposal: a feasible concept for future sea state and current mission

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Résumé

The Sea surface Kinematics Multiscale monitoring (SKIM) was one of the two candidate missions for which a successful phase A was conducted as part of the Earth Explorer 9 program, although SKIM was not selected for implementation. SKIM was designed around the SKIM Ka-band Radar (SKaR), borrowing the general measurement concept of SWIM with the addition of a Doppler measurement and changing from Ku to Ka-band. The scientific objectives included both measurement of surface currents and sea state, but here we will only focus on sea states.

The change from Ku to Ka band with a similar antenna size results in a footprint that is 3 times smaller. This smaller footprint allows the investigation of smaller scale variation in the sea state, but it also gives gaps in the spatial coverage. The smaller footprint also reduces the directional resolution of the measurement, in particular when using Doppler beam sharpening with a wider range of directions contributing to the measured modulations in any given azimuth. Instrument simulations (below) suggest that the SKaR design is equally impacted by the lower number of effective looks when looking along the satellite track and it is not possible to retrieve the wave spectrum within an angular sector that is about 10∘ wide. However, Doppler measurements should have modulations in those directions that may help fill that gap. Also, with a 200 MHz bandwidth instead of 320 MHz on SWIM but a larger number of pulses per cycle, the use of Ka band produces a lower speckle level that allows to measure shorter wave components, down to L=40 m. Accessing these shorter waves are important for air-sea interactions, including the estimate of Stokes drift, and also

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allow measuring sea states in coastal regions and enclosed seas.