

Ka-band Doppler Scatterometer (DopplerScatt) for Measurements of Ocean Vector Winds and Surface Currents

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Objective

- Develop a proof-of-concept Ka-band Doppler scatterometer (DopplerScatt) to demonstrate simultaneous direct measurements of ocean vector winds and surface currents over a wide swath for future spaceborne scatterometer.
 - These coupled measurements will enable improved understanding of relevant air-sea interactions and their influence on heat transport, surface momentum and gas fluxes, ocean productivity and marine biology.
- Targeted performance characteristics:
 - Surface current velocity: 1 m/s bias with 10 cm/s precision
 - Wind speed: 2 m/s accuracy in 3-20 m/s speed range 10% accuracy in 20-30 m/s speed range
 - Wind direction: 20 degrees accuracy
 - Spatial resolution: 5 km
- Demonstrate the concept and performance of DopplerScatt in lab tests over temperature and in airborne test flights.







DopplerScatt prototype mounted on King Air B200



DopplerScatt measurements over Columbia River bank on 9/13/16 captured the horizontal motion of internal waves generated by the river plume front. Such information is important to the understanding of coastal water mixing.

Accomplishments

- Designed, assembled and fully tested an airborne Ka-band pencil-beam Doppler scatterometer, a.k.a. DopplerScatt
- Developed and validated the processing algorithms for simultaneous estimation of ocean surface current and wind velocities including new wind and current Geophysical Model Functions at Ka-band
- Integrated DopplerScatt onto the King Air B200 aircraft and flew three engineering flights to test the radar functions and operations in June of 2016 (Lake Tahoe, Rosamond Lake. Monterey Bay)
- Participated in three airborne science campaigns and collected over 60 hours of data: Portland, OR sampling the California current and observing the Columbia River mouth (September 2016); New Orleans, LA – SPLASH (Submesoscale Processes and Lagrangian Analysis of the Shelf) field campaign (April 2017); Monterey Bay, CA – CANON (Controlled, Agile, and Novel Ocean Network) field campaign (May 2017)
- Demonstrated DopplerScatt's intended measurement capabilities through preliminary data processing and analyses
 - Surface current velocity: 5 15 cm/s precision; bias under evaluation
 - Wind speed: 1 m/s accuracy in 3-20 m/s speed range; no data acquired so far in the 20-30 m/s speed range
 - Wind direction: 15 degrees accuracy
 - Spatial resolution: 200 m on current measurements; 1 km on wind measurements

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$$TRL_{in} = 3$$
 $TRL_{out} = 6$

