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

PI: Dragana Perkovic-Martin, JPL

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.
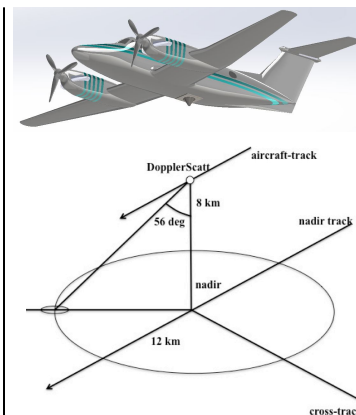
Pencil-beam concept for the airborne DopplerScatt with wide-swath coverage
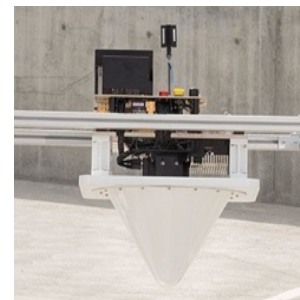
DopplerScatt prototype mounted on King Air B200
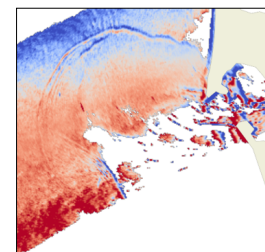
DopplerScatt measurements over Columbia River bank on 9/13/16 captured the horizontal motion of internal waves generated by the river plume front. Such information is important to the understanding of coastal water mixing.

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

Co-Is/Partners: Mauricio Sanchez-Barbetty, Maxim Neumann, Ernesto Rodriguez, JPL; Gordon Farquharson, APL/U. Washington

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

Earth Science Technology Office