

# Phase-Delay Altimetry from Reflected GNSS Signals for Resolving Mesoscale Ocean Circulation Features

*R. Steven Nerem, University of Colorado*

**Purpose:** Analyze the coherent signal levels as functions of sea surface conditions and signal parameters and to retrieve sea surface height information from coherent GNSS-R measurements

**Study Objective:** Assess the feasibility of using reflected GNSS signals received on a Spire satellite in LEO satellite with its low cost, small volume, and low power hardware for high accuracy ocean altimetry applications

**Data:** GNSS-Reflectometry measurements

**Findings:** The team evaluated the feasibility of using reflected GNSS signals received from Spire LEO satellites to retrieve sea surface height for ocean altimetry applications. They found good phase coherency for low grazing angle reflections and were able to obtain preliminary SSH information. These SSH measurements have good agreement with a MSS model derived from traditional radar altimeter satellites, with deviations in the expected range for ocean dynamic processes. The SSH precision is estimated as 2.5 cm for 1-second averages. The SSH accuracy will require more evaluation but is better than 10 cm. GNSS-R phase-delay altimetry has significant promise for measuring SSH changes in the future.



The retrieved (left, blue) and mean (left, red) sea surface height. The difference of the two (right, blue) illustrates the SSH variability seen in the observations.