GNSS-Reflectometry: a Cost-effective Solution for Global Ocean Winds

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Overview

TechDemoSat-1 (UK)
- Mini-satellite
- 150Kg
- 1m^3
- 8 techno/scientific demo payloads

SGS-RESI receiver module
- 5-10W
- 1Kg

Mission Cost

TDS-1	~10 MGBP
CYGNSS	~150 MUSD

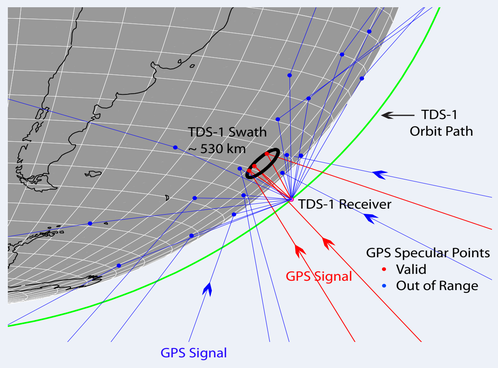


SGS-ReSI receiver module

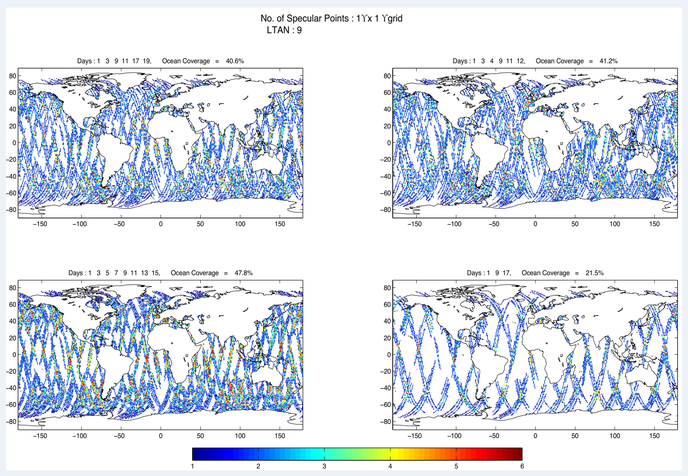


TechDemoSat-1 satellite

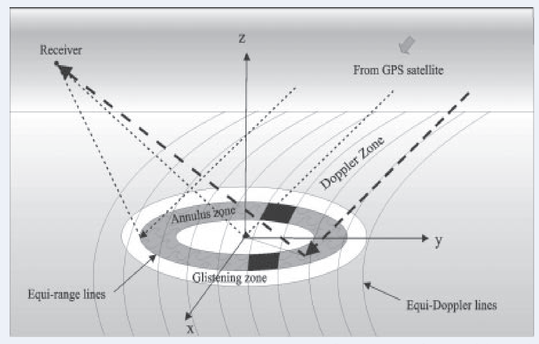
GNSS-Reflectometry



Concept
- GNSS signals reflected by the ocean surface
- Forward scattering
- L-Band Bistatic Radar configuration
- MEO Tx (GNSS), LEO Rx (TDS-1)
- Zenith antenna, Nadir antenna
- Dual frequency (L1, L2) - Galileo, GLONASS



TDS-1 Simulated sampling coverage

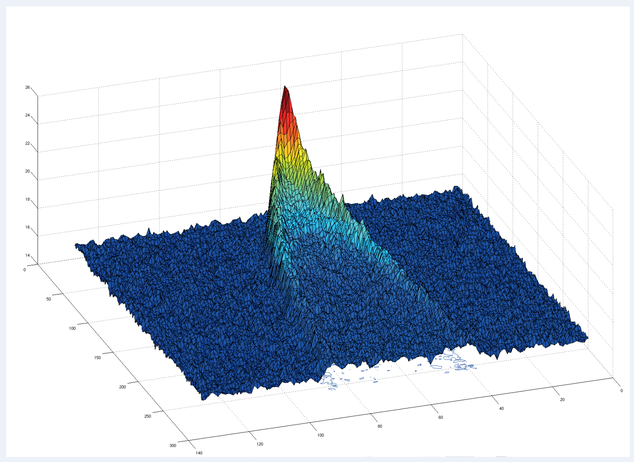


After Komjathy et al (2000)

Outlook
- Unprecedented sampling rate
- Global coverage of sea state and winds
- Potential for hurricane monitoring

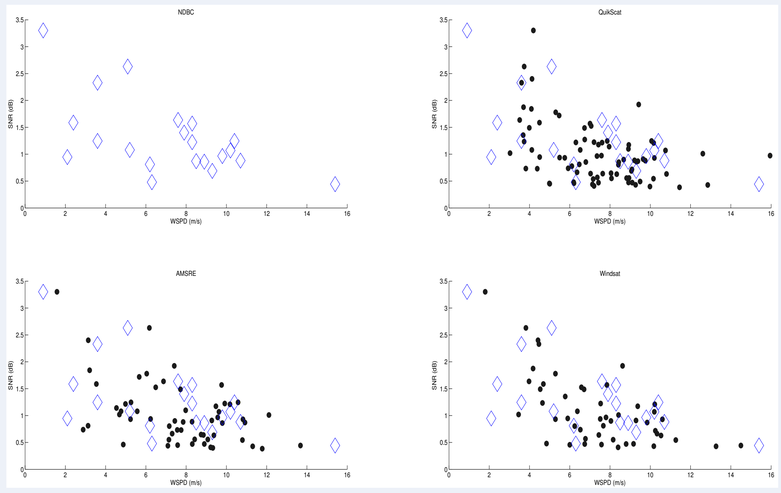
Current Work

Geophysical inversion
- Link of EM scattered power to sea state/wind
- Acquisition noise
- Speckle noise

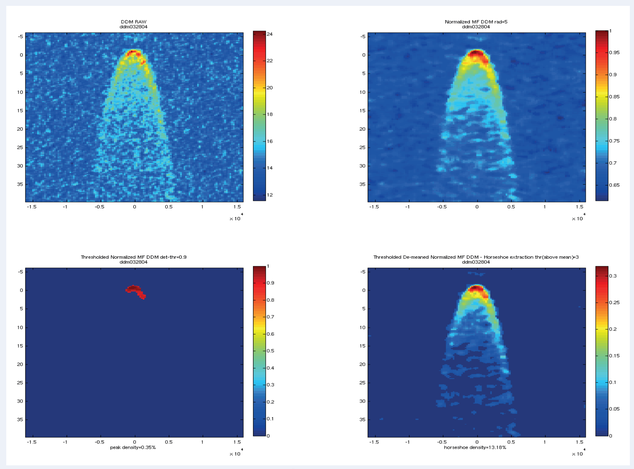


Delay/doppler map of scattered power

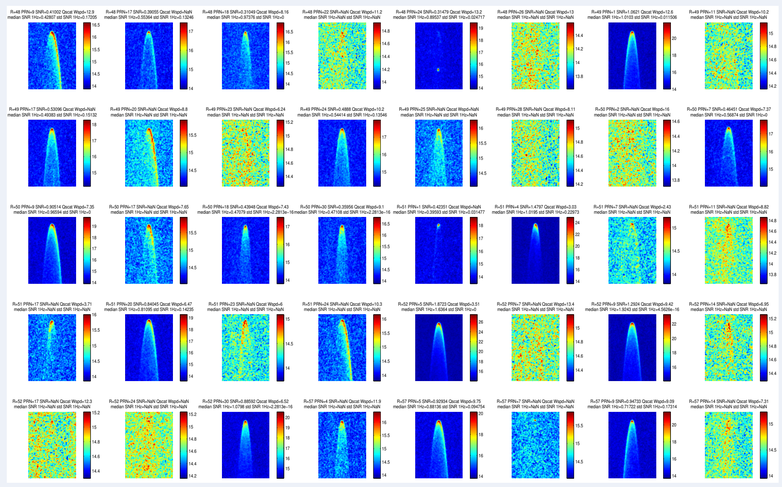
Calibration data sources
- Buoys
- Satellites
- Model output



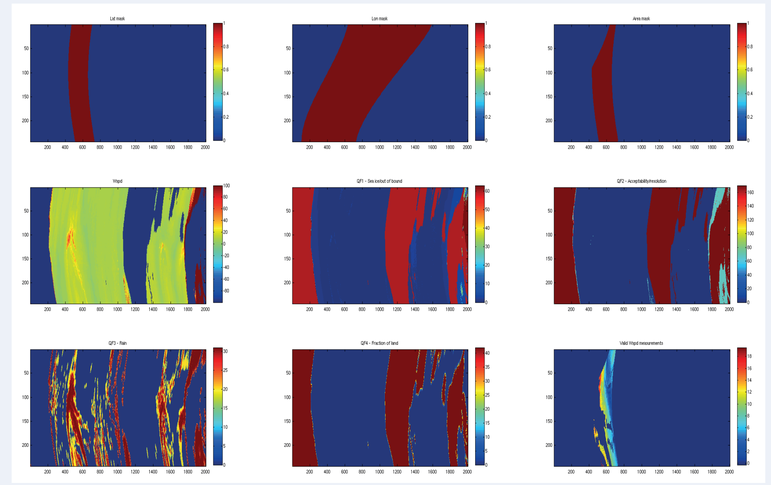
Windspeed retrieval performance using different calibration datasets (buoys, sats)



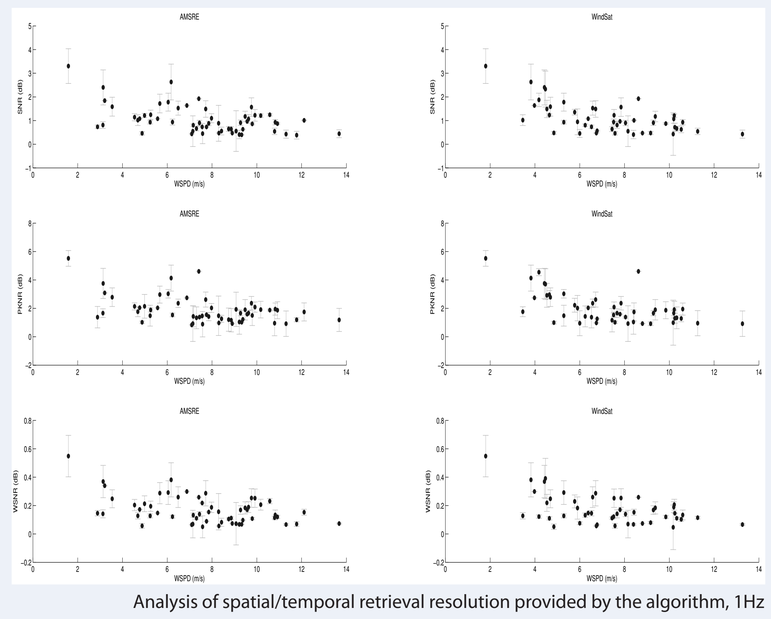
Data processing - noise mitigation, feature extraction



Results with UK-DMC data



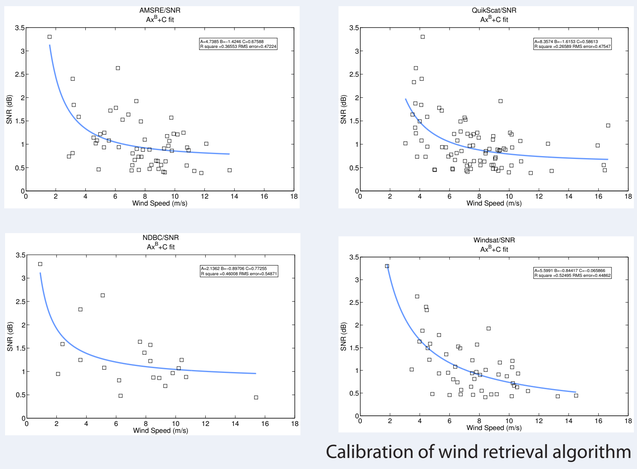
Wind measurement retrieval from other satellite data (scatterometers, passive MW)



Analysis of spatial/temporal retrieval resolution provided by the algorithm, 1Hz

Outlook

Future
- TDS-1 launch scheduled June 2014
- Calibration of wind retrieval algorithm
- Develoment of a full delay/doppler inversion workflow based on a theoretical EM scattering model (Z-V) to retrieve wind direction (TBC)



Calibration of wind retrieval algorithm

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