Ocean Surface Topography Science Team Meeting (OSTST)

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Virtual meeting

Multi-Sensor Air-Sea Interaction Studies using the Satellite Altimeter Constellation

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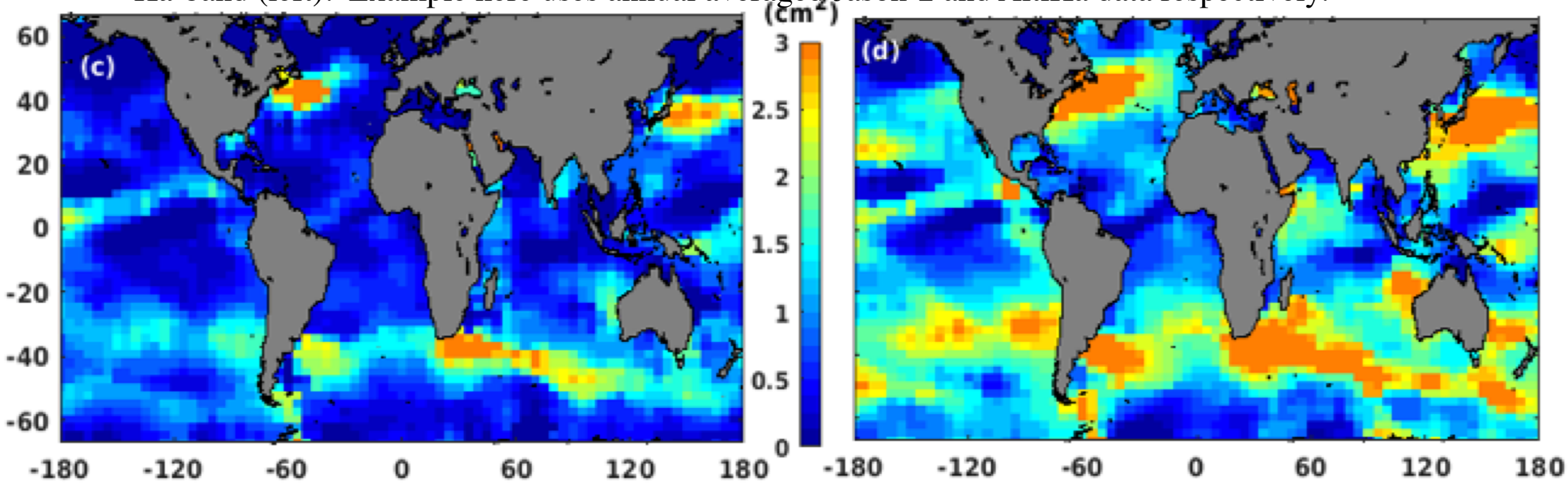
Sea State Bias Range Correction Activities

Our group (Vandemark, Feng, Tran, and Chapron) have been engaged in developing SSB models that address both LRM and SAR mode datasets, evolving JPL retracked Topex/Poseidon datasets, C-band vs. Ku-band vs. Ka-band SSB models, and in finalizing three input SSB models for multiple mission GDR-F data products.

1. Tran N., D. Vandemark, E. D. Zaron, G. Dibarboure, and N. Picot, Assessing the effects of sea-state related errors on the precision of high-rate Jason-3 altimeter sea level data. Advances in Space Research. 10.1016/j.asr.2019.11.034, 2019.
2. Vandemark, D., Hui Feng, N. Tran and Bertrand Chapron, Evaluation of Ku and Ka-band sea state bias correction variability using Jason-3 and AltiKa data, 2019 OSTST Meeting, Chicago.
3. Feng, H., D. Vandemark, N. Tran, and S. Desai, Sea state bias for TOPEX side B retracked altimeter data, NASA Ocean Surface Topography Science Team Meeting, Chicago, Oct. 2019.
4. Tran, N., Vandemark, D. H. Feng, F. Ardhuin, L. Aouf, S. LeGac, and N Picot, Updated Jason-3 wind speed and SSB solutions (2D and 3D), NASA OSTST meeting, Miami, Oct. 2017.

Global maps of SSHA noise reduction due to sea state using 3D SSB models demonstrates the geophysical fact that long wave nonlinearity impacts the Ku-band SSB (right) more than for Ka-band (left). Example here uses annual averaged Jason-2 and AltiKa data respectively.



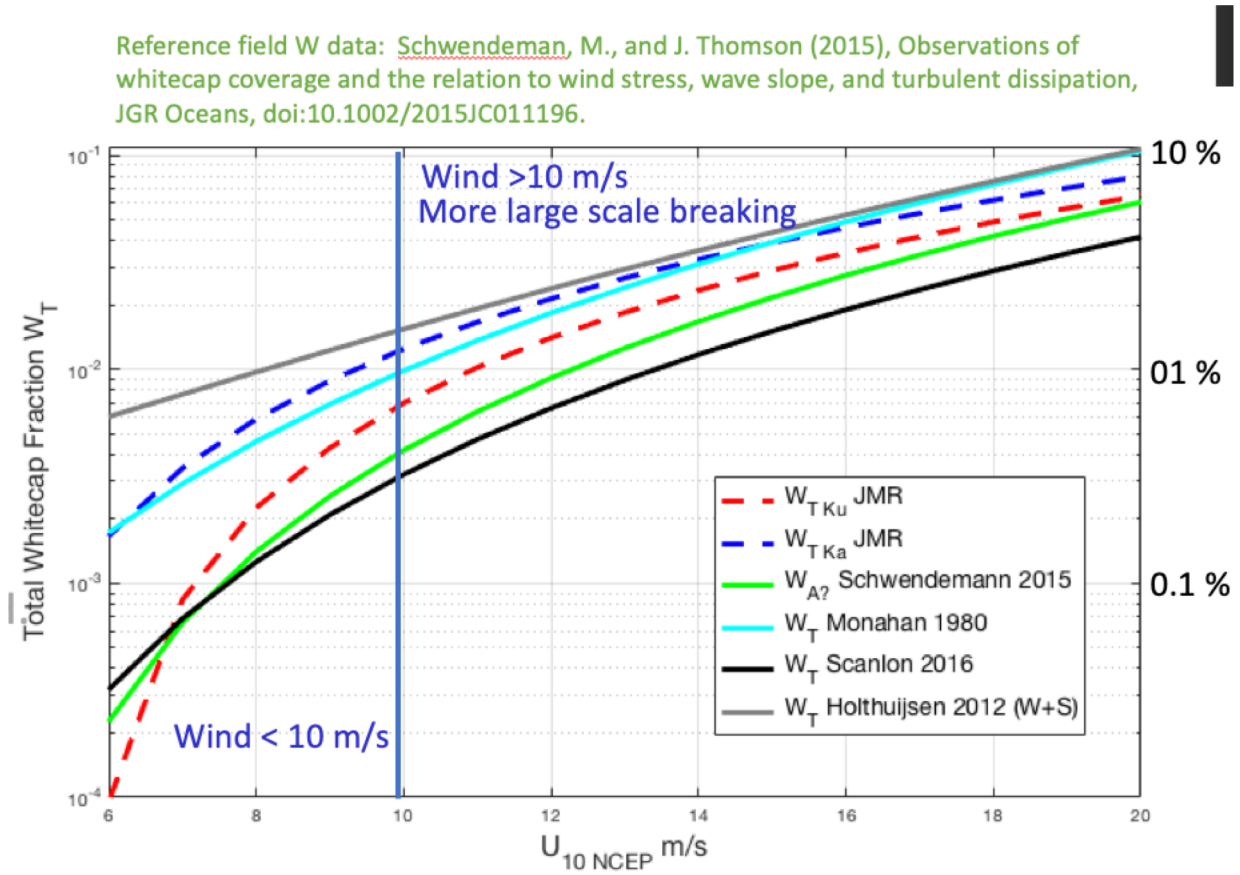
Ocean whitecap detection by combining Jason satellite radiometer and altimeter data

Objectives

Exploit combined satellite radiometer and altimeter data to resolve and quantify surface foam fraction as a proxy for wave breaking. Study uses unique advantages of nadir radiometry to check and improve on off-nadir approaches that use Windsat and SSM/I sensors.

Results

- New Jason Microwave radiometer (JMR) models for whitecap coverage (W, as %) are shown at left – they agree well with field-derived data
- Results somewhat at odds with best Windsat models
- Clearest benefit of Jason approach is ability to show expected ocean wavefield impacts on W



Vandemark, D., H. Feng, Y. Quilfen, and B. Chapron, Detection of ocean white-capping and its variability using Jason radiometer and radar datasets, 25 years of Progress in Altimetry Symposium, Ponta Delgada, Sept. 2018.

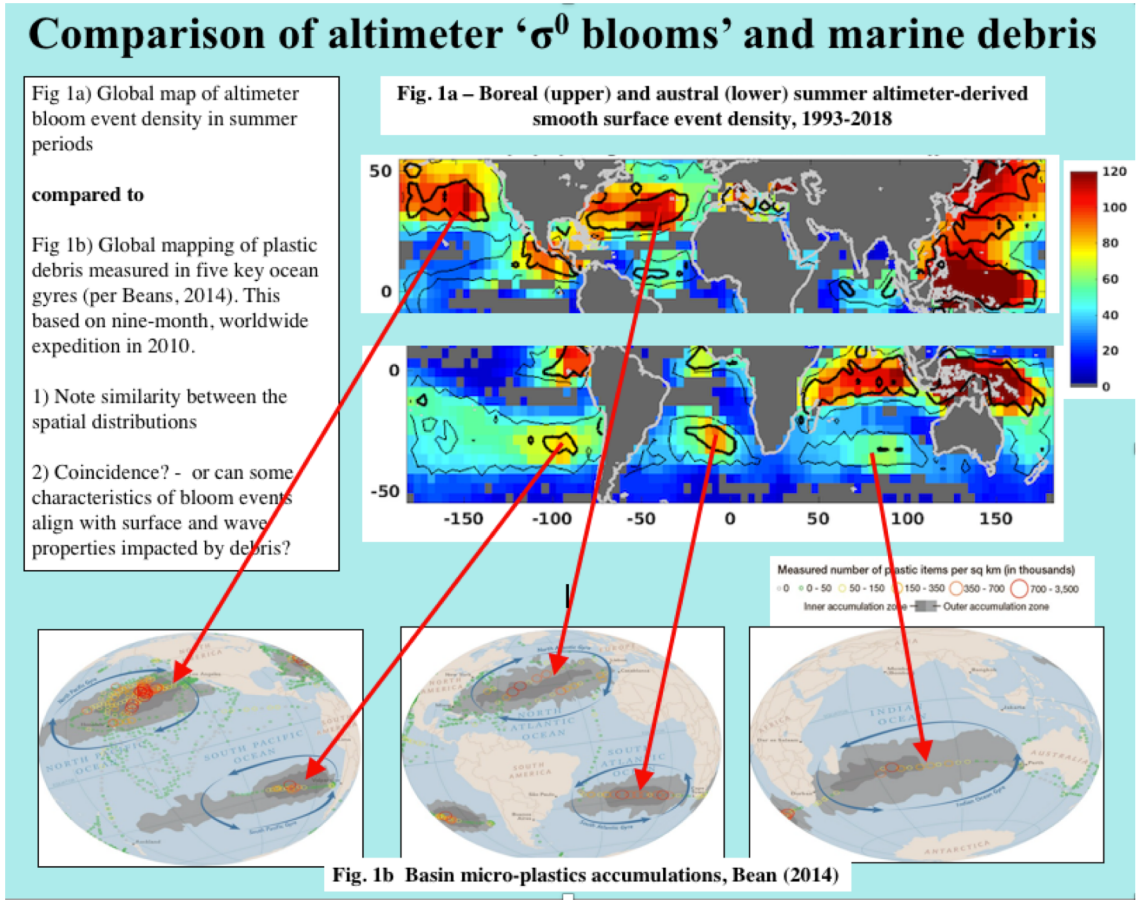
Variability in altimeter-detected ocean slicks

Objectives

Revisit known satellite altimeter capability to resolve smooth/slick ocean events and map these data from 1993-present in space/time. Study anticipates new insight will come from new Sentinel 3 and 6 altimeter datasets

Results

- New calibrated calm-ocean datasets from multiple altimeter missions, 1993-2017
- Seasonality is readily mapped
- Interannual variation is weak
- Slick surface regions coincide with marine debris hot spots



Vandemark et al., Global ocean smooth surface conditions and temporal change detected using the Topex-to- Jason altimeter time series data, NASA Ocean Surface Topography Science Team meeting, Miami, Oct. 2017.

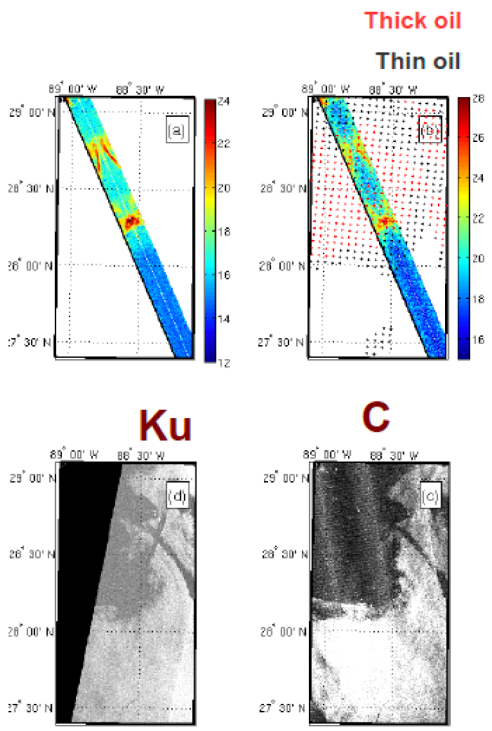
Identifying biogenic surface films using altimetry – part 2

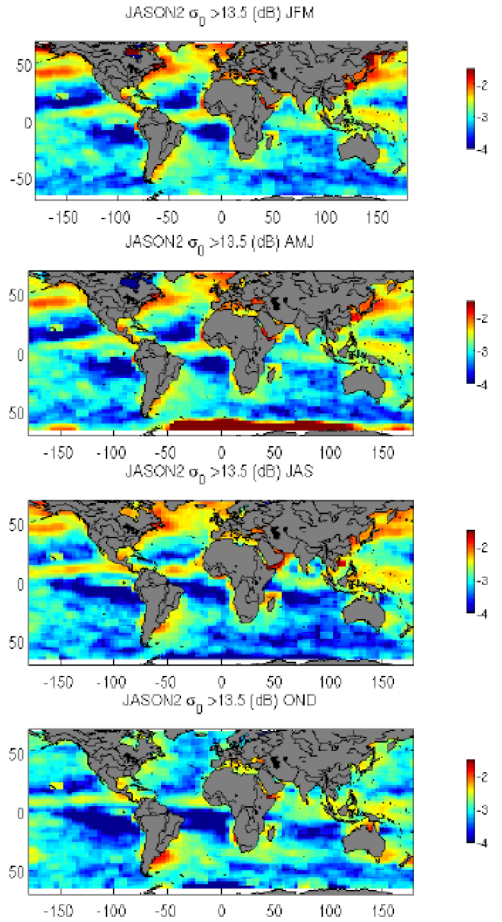
Objectives

- Test capability of satellite altimeters to discriminate between calm water and water with surface slicks

Results

- Ocean regions identified with high Chlorophyll and surface slicks
- Using two-frequency radar data to detect film events





Left: Ku- and C-band altimeter data show diff. due to films
Right: method exploits this difference for global seasonal mapping of detected films

Tournadre, J. and D. Vandemark, Surface films: is it possible to detect then using Ku/C band sigma0 relationships?, Invited talk, NASA Ocean Surface Topography Science Team Meeting, Chicago, Oct. 2019.