SOCD Organization

SOCD Chief: Dr. Paul M. DiGiacomo

Ocean Sensors Branch

Chief: Dr. Alexander (Sasha) Ignatov

• Sea Surface Temp, Ocean Winds, Ocean Optics (eg Chesapeake Bay) & Dynamics

Marine Ecosystems & Climate Branch

Chief: Dr. Menghua Wang

• Ocean Color, Coral Reefs, Sea Ice, Synthetic Aperture Radar, GOES SST

Laboratory for Satellite Altimetry

Chief: Dr. Laury Miller

• Sea Level, Bathymetry, Waves, Sea Ice

Science Teams: R2O

• Sea Surface Height
• Sea Surface Roughness
• Sea Surface Salinity
• Sea Surface Temperature
• Ocean Color Radiometry
• Ocean Surface Vector Winds
• OceanWatch
• Coral Reef Watch
• Sea Ice

Major Programs/Activities

• JPSS: Ocean Color & SST EDRs
• GOES-R: SST (& Ocean Dynamics)
• JASON Altimeter Program
• NOAA GCOM Program
• National Ice Center
• Foreign Sensors: Winds, SAR, etc
• Marine Optical Buoy (MOBY)
• CoastWatch & Coral Reef Watch
NOAA's Sea, Lake, and Overland Surge from Hurricanes (SLOSH) model shows a similar linear rise across continental shelf, but underestimates altimetric observations by nearly one half.

HY-2A Crossed Sandy within 1 hour of peak surge
- Altimeter measured 1.4 m max
- Tide gauge measured 1.7 m max

Lillibrige et al., *Oceanog*, 2013
Satellite Altimetry and the Gulf Stream’s Seasonal Cycle

Transects of Absolute Sea Surface Height across the Gulf Stream from Topex & Jason every 10 days

Seasonal Cycle of $\Delta$SSH Across GS

20 Years of SSH: August, 1992 to Present

20 Year Hovmöller Plot

Ref: Lillibridge & Mariano, DSR-II, 2012
NIC Implementing JPL Automated Sea Ice Class Distribution Product Using OSCAT

Once Operational Access is available through OSPO

March 1, 2012

Seasonal Sea Ice Cover

Perennial Sea Ice Cover

March 1, 2013
NIC Looks Forward to These Future Missions for Operational Monitoring of Ice & Snow

- **ESA Sentinel-1**: LAUNCH PLANNED FOR 2014-2016
- **CSA RADARSAT Constellation Mission (RCM)**
- **NASA Soil Moisture Active and Passive (SMAP)**: LAUNCH PLANNED FOR 2014
- **CSA Polar Communication and Weather (PCW)**: LAUNCH PLANNED FOR 2018
- **TENTATIVE LAUNCH PLANNED FOR 2017-2018**
• Participate in NASA Operation Ice Bridge (OIB) science team
• Conduct airborne surveys of Arctic sea ice every March/April
• Design surveys to under-fly the European Space Agency’s CryoSat-2 to improve understanding of SIRAL radar altimeter
• Support NASA ICESat-2 prelaunch activities.
• Collaborate with federal partners NASA, NRL, CRREL, and NOAA/NWS/NCEP/EMC (sea ice modeling), and university partners (e.g. Oregon State Uni., Uni. College London, University of York, Canada).
Scientific Analyses of Arctic Sea Ice

- **Calibration and Validation:** Comparisons of in situ measurements with airborne data sets to understand accuracy of airborne data over various sea ice types
- **Scale up:** Validation of satellite laser (ICESat) and radar (Envisat, CryoSat-2) altimeters using airborne measurements
- **Climate Trends:** Analysis of state and variability in Arctic sea ice freeboard, thickness and snow on sea ice
- **Key Parameters:** Assess lead frequency, sea ice drift dynamics, marginal ice zone

*Image credits: Laxon et al., 2013*
Advanced Clear-Sky Processor for Oceans Reanalysis (ACSPO-RAN)

Project Goals
1. Generate/Maintain consistent AVHRR GAC L2 SST record based on NOAA ACSPO system
2. Process all NOAA & Metop platforms, consistently validate and monitor online

Current Status
1. 12 years (2002-13) of data processed from NOAA-15, -16, -17, -18, -19, Metop-A and -B
2. Displayed online, tweaking ACSPO system and analyses
3. Working with Blended and CRW Teams

Looking Forward
1. Input ACSPO-RAN into NOAA Geo-Polar Blended analysis
2. Use for Coral-Reef Watch
3. 2014: Extend time series to 1994
4. 2015+: Cover AVHRR era 1981-pr

Courtesy A. Ignatov, NOAA
5km Daily Global Geo-Polar Blended SST Operational Analysis is generated using a suite of SST retrievals generated by NOAA. The geostationary platforms include operational NOAA GOES-E (75°W) and GOES-W (135°W), and also Meteosat-9 (0°E) and MTSAT-2 (145°E), operated by EUMETSAT and JMA respectively. Polar orbiter data are provided by the operational NOAA-19 (EQX ~14:00 local time) and METOP-A (EQX ~10:30 local time) satellites, operated by NOAA and EUMETSAT respectively. Input data are bias corrected with reference to the operational NCEP RTG_HR SST Analysis product. This is found to be an essential step prior to operation of the analysis estimator.
NOAA Coral Reef Watch
Satellite Bleaching Thermal Stress Monitoring and Forecasting

Image of Coral Reef Watch’s experimental weekly global Climate Forecast System (CFS)-based Seasonal Coral Bleaching Thermal Stress Outlook at 60% likelihood of bleaching thermal stress (top), with its probability distribution of potential Alert Level 1 or higher thermal stress (embedded), compared with near-real-time satellite observed thermal stress (bottom), for June-September 2013.

http://coralreefwatch.noaa.gov
NOAA Coral Reef Watch
Regional Daily Light Stress Damage (LSD) Product

(Under development)

NOAA GOES Surface & Insolation Products (GSIP) 1/8 degree.

(NOAA Coral Reef Watch Collaboration with the Universidad Nacional Autónoma de México, the University of Queensland, and the University of Exeter)

http://coralreefwatch.noaa.gov
VIIRS Global Monthly Chlorophyll-a Image

Log scale: 0.01 to 64 mg/m³

Generated using NOAA-MSL12 for VIIRS ocean color data processing

Monthly chlor_a: 201202
GOCI NOAA-MSL12 $K_d(490)$ (2012-03-25) in Bohai Sea

Diurnal Changes (Box1)
GOCI NOAA-MSL12 $K_d(490)$ (Turbidity) (2012-03-25) (Early Spring)
A big picture of water quality remote sensing in the Chesapeake Bay

Research and monitoring capacity-building advise Environmental policy-makers and managers

Satellites

Chesapeake Bay Program

Ship-board sampling

Nutrients and sediments

Phytoplankton blooms (including harmful ones)

River discharge

Data

Data

Data

Nutrients and sediments

Collapse of fishery harvests

Seagrass habitat loss

Hypoxia

Fish and shellfish kills

Reduced biodiversity

Transect of Chesapeake Bay main stem

River mouth

Mouth of bay

Courtesy: Guangming Zheng
Wind Field Distribution within Hurricane Force Extratropical Cyclones Over North Pacific and Atlantic Using QuikSCAT Scatterometer Measurements

Zorana Jelenak
Paul S. Chang
Seubson Soisuvarn
NOAA/NESDIS/StAR
and
Joseph Sienkiewicz
NOAA/NCEP/OPC

Number of Extratropical cyclones that Reached Hurricane Force (HF) Intensity for Eight Cold Seasons Dec 2001 – May 2008

ASCAT

QuikSCAT

NOAA P3 Flight Experiment
7 yr average number of extratropical cyclones observed (contoured) with hurricane force winds for the years 2001 - 2008
Coastal Wind Climatology

**Applications**
- Met. Forecast Guidelines
- Wind Farm Location
- Ocean Engineering
- Coastal Decisionmaking

RADARSAT-1  Sept. 04, 2000 0306 GMT
Wind Image of Barrier Jet (Beal et al., 2005)

Barrier Jet Percent Occurrence along Northern Coast of Gulf of Alaska – JHU/APL
(Winstead et al., 2006; Monaldo et al., 2006, and Loescher et al, 2005)
Coastal wind climatology products will be of use for studies of coastal atmospheric phenomena and assessment of offshore wind power potential.

The mean wind power flux density in Watts/m2 off the coast of Maryland. Gray represents a land mask and power density is encoded as color. The color red represents 600 Watts/m2.

- Paper accepted for publication: Frank Monaldo, X. Li, W. Pichel, C. Jackson, Ocean Wind Speed Climatology from Spaceborne SAR Imagery, Submitted to Bulletin of the American Meteorological Society in December 2012. Accepted for publication July 2013.

Coastal wind climatology products will be of use for studies of coastal atmospheric phenomena and assessment of offshore wind power potential.
Collaboration
- NWS/Climate Prediction Center
- NESDIS/STAR
- NESDIS/National Oceanographic Data Center
  - Marine Data Stewardship Div
  - Ocean Climate Lab

Statistically blends SMOS and Aquarius satellite SSS data with \textit{in situ} observations via:
1. Localized PDF matching to remove biases in satellite obs
2. Optimum interpolation of bias-corrected satellite retrievals with \textit{in situ} data
OceanWatch 2013

1. CoastWatch to OceanWatch
2. MOBY Operations and Technology Refresh
3. Big Data at STAR
4. JPSS Proving Ground/Ocean Color
5. VIIRS Ocean Color  NOAA Unique Product Operationalization

OceanWatch reports at: coastwatch.noaa.gov/reports
Upcoming from OceanWatch

• OceanWatch National Deployment Continues
• NOAA Operational Ocean Color Transitioned to ESPC
• MOBY Technology Refresh Reduces Risk
• Sentinel Utilization to Support VIIRS Augmentation and Enhancements
• X-band Ocean Color for all CONUS and Hawai’i
• Operational Ocean Color to be Used in NOAA Weather and Climate Models
• Ocean Color and other Ocean Remote Sensing Demonstrated Use in NOAA Fisheries Model
• Ecological Forecasting System Enhancements through Ocean Remote Sensing

OceanWatch reports at: coastwatch.noaa.gov/reports