Satellite Measurements To Extend Applications of *In Situ* Measurements from IOOS and OOI

How can we use satellite measurements to extend the value to research and applications of measurements from IOOS and OOI observing systems, i.e., can the whole be greater than the sum of the parts?

Jim Yoder
WHOI
Outline

Have IOOS and OOI programs studied this question?
Are there appropriate models to consider?
What ocean science subfields will benefit the most from a report?
What measurements will be available from IOOS and OOI?
What satellite measurements will be available?: Lw, SST, SSH, Winds, SSS
How are satellite and *in situ* measurements combined?
What is the role of numerical models as data integrators?
This is a broad topic. What should be the focus?
Have those involved with IOOS and OOI studied this question?

Apparently Not (although E. Lindstrom disagrees).

Chair of the OOI Program Advisory Committee believes that ties to remote sensing are lacking in OOI. Supports RCN efforts.

Zdenka Willis (NOAA-IOOS) is not aware of any reports on this topic. nor does she believe that IOOS has focused on it in any way.
Are there appropriate models to consider?

From Chave et al. 2009
Are there appropriate models to consider? GHRSST is a specific example.

GHRSST program provides merged, gridded and gap-free SST data sets produced from in situ, satellite microwave and satellite infrared sensor data.

From Donlon et al. 2009
What subfields of ocean science would benefit the most from a report?

Global-scale physical oceanography is probably there already.

Continuous satellite measurements of SSH, SST, Winds, Ice and OCR

From Clark et al. 2009
What satellite and *in situ* measurements will be available?

What measurements, other than salinity and temperature will be available from IOOS and OOI in the future?

Good question.

What satellite measurements will be available?

$L_w$, SST, SSH, Winds, sea ice, and SSS now available. For the future, high resolution SSH will be also available from SWOT, plus improved $L_w$. 
How are satellite and *in situ* data combined?

Some of the data assimilation methods used by GODAE systems:

<table>
<thead>
<tr>
<th>System Name</th>
<th>Country</th>
<th>Data Assimilation Method</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>BODAS</td>
<td>Australia</td>
<td>Ensemble Optimal interpolation</td>
<td>Oke et al., 2008</td>
</tr>
<tr>
<td>ECCO-JPL</td>
<td>USA</td>
<td>Kalman filter and smoother</td>
<td>Fukumori, 2002</td>
</tr>
<tr>
<td>FOAM</td>
<td>UK</td>
<td>Analysis correction</td>
<td>Martin et al. 2007</td>
</tr>
<tr>
<td>Mercator</td>
<td>France</td>
<td>Static SEEK filter</td>
<td>Brasseur et al., 2005</td>
</tr>
<tr>
<td>MOVE/MRI.COM</td>
<td>Japan</td>
<td>multivariate 3DVAR</td>
<td>Fujii and Kamachi, 2003</td>
</tr>
</tbody>
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Growing a Distributed Ocean Observatory:
Our View From the COOL Room

A) 1998–2001: Coastal Predictive Skill Experiments

B) 2001–2005: Campaign Science in the Cool Room

C) 2005–Present: Distributed Campaign Science via the Internet
What are the best opportunities?

Coastal and interdisciplinary.

Lindstrom: “New satellites are on the way (GeoCape and SWOT) that will have better resolution for coastal waters.”

“Focus on a topic/subject that gets out in front. Vision for 2020 or 2025. What’s missing?”