NASA Biodiversity and Ecological Forecasting Team Meeting

Marine Break-Out Session

May 8, 2014

1. What are the ecosystem characteristics or dynamics that will allow the forecasting of marine organism from egg to adult with remote sensing?

larval survival

drift dynamics

changes in productivity

Patch scale that results in the feeding of larvae

I.e., Can we forecast recruitment?

2. How will loss of sea ice at high latitudes affect the productivity of marine organisms?

3. How can we improve data sharing?

4. I think we need to be thinking about disturbance dynamics influence on ecosystem dynamics.

5. How can we learn about how organic carbon is concentrated, so it can move up to bigger levels?

Trying to nail down cell size in the ocean—big cells

Frontogenesis, frontal dynamics

Swarming behavior

6. How does lower trophic level biodiversity affect ecosystems function up higher trophic levels, and how do those systems respond to environmental stresses?

Data informatics; “virtual observatories”

Like the virtual solar observatory—formalized informatics technologies

7. What are the variables at the land sea interface that influence the transfer of pathogens?

Bringing in the human-health dynamic.

8. Remote sensing could play a role within ecosystem management, particularly species distribution models. Marine-spatial planning, dynamic ocean management.

9. Identifying new data sources that can help inform understanding ecosystem properties. Other than corals, primary productivity—identify other data types to help characterize ecosystem properties.

10. Connectivity at the land, air, and sea interface. Bring together the terrestrial ecologist, atmospheric chemistry models, marine ecologists, etc.

Sensor web approach

What is the role of submerged and floating plants in carbon nutrient cycles in the ocean?

Most carbon modelers don’t consider floating grass, but those numbers add up.

 This will involve identification characteristics of the species from space

 How much of this coastal carbon is exported offshore?

11. How changes in society as a whole affect the coastal marine ecosystems—from a fisheries, tourism point of view, consider overpopulation in coastal areas.

Workshops so NGOs, etc, can understand what products are available to them.

12. Discuss how we get beyond chlorophyll—the equivalent of CDRs for productivity in the ocean.
 What might a marine CDR look like?

 Functional or taxonomic identifiers for ocean constituents

13. Keeping track of the quality of in-situ data. A lot of sources don’t have any metadata about calibration, etc.

14. Satellite monitoring of coral bleaching.

Factors which cause coral bleaching:

light intensity

cloud cover

temperature

surface wind – water column mixing

 circulation

 turbidity

Coastal dynamics

Ocean color products - for monitoring land based pollution

Better tools, high spatial resolution – finer scale understanding of coastal ecosystem dynamics

Measurements of UV radiation in tropical areas

15. How does climate change affect the carbon cycle?

The word is now blue carbon; there is vastly more carbon below-ground.

How does climate change affect blue carbon, mainly carbon storage in coastal ecosystems?

How does that affect the ability of these systems to keep pace with rising sea level?

Island nations, coastal communities—and that carbon is affecting the color of the water.

16. How will changes in the frequency and intensity of extreme events impact native and non-native species.

17. Solving existing issues in RS data—focusing on urban community-coastal interface. Providing the community with tools that they need to tackle these issues.

18. Importance of coastal habitats—immensely susceptible to disturbance.

Put resources in that direction.

Finer scale observations—pixel size issue, as well as temporal resolution.

In many of these habitats, the primary organisms are very abundant such as seagrass, or are infaunal organisms which are the drivers of the dynamics. And worrying about the limitations on those ecosystem engineers would be a profitable way to think about these ecosystems.

19. The spread of invasive species: we need to do mean trends, and understand the variability and extremes of the livability conditions of invasive species. The variability is critical—as are extreme events in all forms.

20. Urbanization—overfishing is a huge problem, as is boat traffic, not just for collision, but for erosion, etc.

21. Phytoplankton functional types, understanding their physiological state, functional or taxonomic types.

Common Themes:

**1.** **Coastal Zones** – Impacts of urbanization, increasing human population, and our need to do a better job understanding physical and chemical dynamics to get a better handle on the biology.

Land/Sea/Air interface

 We don’t have very good estimates of wave disturbance

Human/Anthropogenic dimension

Changing land and marine resource use

Offshore energy development and transportation (wind, oil, gas)

Symptoms of challenged systems:

* Coral bleaching
* HABs
* Pathogens

**2. Changes in disturbance cycles – Pulse stressors**

* Wind
* Storms
* Salinity
* Temperature
* Oil spill detection and tracking
* Freshwater input, runoff, nutrient addition
* Acidification and hypoxia events
* Collapse of ice shelf

**3. Press stressors**

* Nutrient addition
* Ocean Acidification
* Sea level rise
* Long-term temperature trends
* Sea ice

**4. Seascape Ecology: Connectivity and Fragmentation, Dispersal, Movement**

Connections between coastal zones, all the way out to the open ocean and back. That includes movement, migration.

Metapopulation theory

**5. Better understanding of trophic dynamics – Aggregating functions**

How does lower trophic level biodiversity affect ecosystem function, including at higher trophic levels, and how do these relationships respond to environmental stressors?

Biophysical interactions

* Phytoplankton
* Zooplankton

* Benthos