An Overview of the IGOS Coastal Theme
Joint CEOP/IGWCO Meeting

1 March 2005
Tokyo, Japan

Coastal Theme Co-Chairs:

Dr. Paul M. DiGiacomo
Jet Propulsion Laboratory

Prof. Liana Talaue-McManus
University of Miami

Goal of IGOS Coastal Theme:

Develop a strategy for integrated global observations that will provide improved understanding of earth system variability and change in the coastal zone, with a particular emphasis on the land-sea-air interface.

Objectives:

- ***Specify*** coastal user information needs and observation requirements
- ***Evaluate*** existing/planned capabilities and identify gaps & continuity needs
- ***Establish*** a framework to integrate observations across the land-sea-air interface in support of coastal research and improved coastal management
- ***Stimulate & facilitate*** coordination & collaboration among diverse groups/organizations

Chairs:	AFFILIATION	COUNTRY
Paul DiGiacomo	NASA-JPL/ CEOS	USA
Liana Talaue McManus	UNIV MIAMI/ IGBP-IHDP LOICZ (Chair)	USA
CEOS representatives:		
Daniel DeLisle	CSA/ CEOS	CANADA
Hiroshi Kawamura	JAXA/ CEOS	JAPAN
Peter Regner	ESA/ CEOS	ITALY
Shailesh Nayak	ISRO/ CEOS	INDIA
Andreas Nuemann	DLR/ CEOS	GERMANY
Eric Bayler	NOAA/ CEOS	USA
Michael Hales	NOAA/ CEOS	USA
“User” representatives:		
Robert Christian	E. CAROLINA UNIV/ C-GTOS (Chair)	USA
Tom Malone	OCEAN.US/ GOOS-COOP (Co-Chair)	USA
Thorkild Aarup	IOC/ GOOS-COOP	FRANCE
Julie Hall	NIWA/ GOOS-COOP/ IGBP-IMBER (Chair)	NEW ZEALAND
Arthur Dahl	UNEP/ IGOS CORAL REEF SUBTHEME (Chair)	SWITZERLAND
Victor Camacho-Ibarra	UNIVERSIDAD-ABC/ IGBP-IHDP LOICZ	MEXICO
Sin-Iti Iwasaki	NRI FOR EARTH SCIENCE & PREVENTION	JAPAN
Nicole Lenôtre	BRGM	FRANCE

Expected Benefits of IGOS Coastal Theme

- **Identify** gaps in observations and reduce unnecessary duplication
- **Strengthen** the linkage between *in situ* and space-based observations, integrated with watershed-ocean models, for coastal research and management applications
- **Stimulate** building of long-term coastal data sets
- **Assist** in the design and implementation of the coastal components of GOOS and GTOS
- **Establish** priorities for research & development projects to improve the operational elements of observing systems and other programmes
- **Support** user needs through improved products and services
- **Cross-cutting** links w/IGOS **Water Cycle**, Ocean, Geohazards, Carbon Themes

Key Milestones to date

- Jan. 2003: *Coastal Theme* Workshop #1 in Washington, D.C.
- June 2003: Approval of *Coastal Theme* proposal at IGOS-P-10 meeting
- Nov. 2003: *Coastal Theme* Workshop #2 in Hamilton, New Zealand
- Feb. 2004: Presentation at CEOS-SIT-13 and IGOS International Workshop
- Feb. 2004: Coastal Theme Workshop #3 in Paris, France
- May 2004: Presentation on Coastal Theme at CEOS-SIT-14 and IGOS-P-11
- July 2004: Presentation on Coastal Theme at COSPAR meeting in Paris, France
- Nov. 2004: Tentative Approval of Coastal Theme Report by IGOS-P/CEOS-SIT

IGOS COASTAL THEME: PRIORITY ISSUES

Coastal Human Populations

- Coastal Hazards
- Coastal Development & Urbanization

Coastal Ecosystems

- Hydrological & Biogeochemical Cycles
- Ecosystem Health & Productivity
  - Coral Reef Subtheme

IGOS COASTAL THEME	GEOSS THRUSTS
USER ISSUES	CLIMATE VARIABILITY & CHANGE
Coastal hazards	Disasters
Coastal development & urbanization	Human Health & Agriculture; energy management
Ecosystem health & productivity	Ecosystem & biodiversity
Hydrological & biogeochemical cycles	Water cycle & weather thrusts

Targeted User Groups

- Regional & global environmental assessments, agencies, accords & conventions
- Advisory & regulatory agencies
- National governments
- Research communities
- Commercial organizations

Coastal Observing Requirements

Geophysical:

ocean winds, waves, sea surface height, currents, salinity, temperature, discharge, precipitation, ice cover;

Biological and Biogeochemical:

pigments, nutrients, particulate and dissolved matter, aerosol properties, slicks and spills, fluorescence, optical properties, O_2 and pCO_2;

Mapping (Physical, Ecological, and Socio-Economic):

topography, bathymetry, shoreline position & use, high/low tide lines, habitat types and condition, land cover/use, reef maps, coastal population assessments/demographics.

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=> Existing space observations provide inadequate spatial, temporal and/or spectral resolution and coverage of coastal regions!

Observation	Knowledge Challenges	Resolution Challenges	Continuity Challenges
Geophysical	•Blending **SST** data streams •Measuring **salinity** remotely •Improve **SSH** measurements •measure **currents** from space •Assimilate HF radar data and derive user products •Develop SAR algorithms & assess other measurements	• Extracting higher resolution info from satellite **wind** sensors • Add additional Doppler weather radar & HF radar sites	• Maintain and expand stream & tide gauge networks • Maintain microwave RS capabilities for **ice** • facilitate HF radar transition: research to operational mode
Biological & Biogeo-chemical	• **Hyperspectral ocean color** • Improve bio-optical algorithms • **Merged chlorophyll products** • Ocean color/ SAR data relationships with ecology • **Taxonomic discrimination** •**Improve aerosol characterization**	• Need ocean color observations from **geostationary orbit** • more nutrient measurements • Rapid & accurate pollutant/pathogen assays	•Maintain global **multi-spectral ocean color** observations for context and climate data records

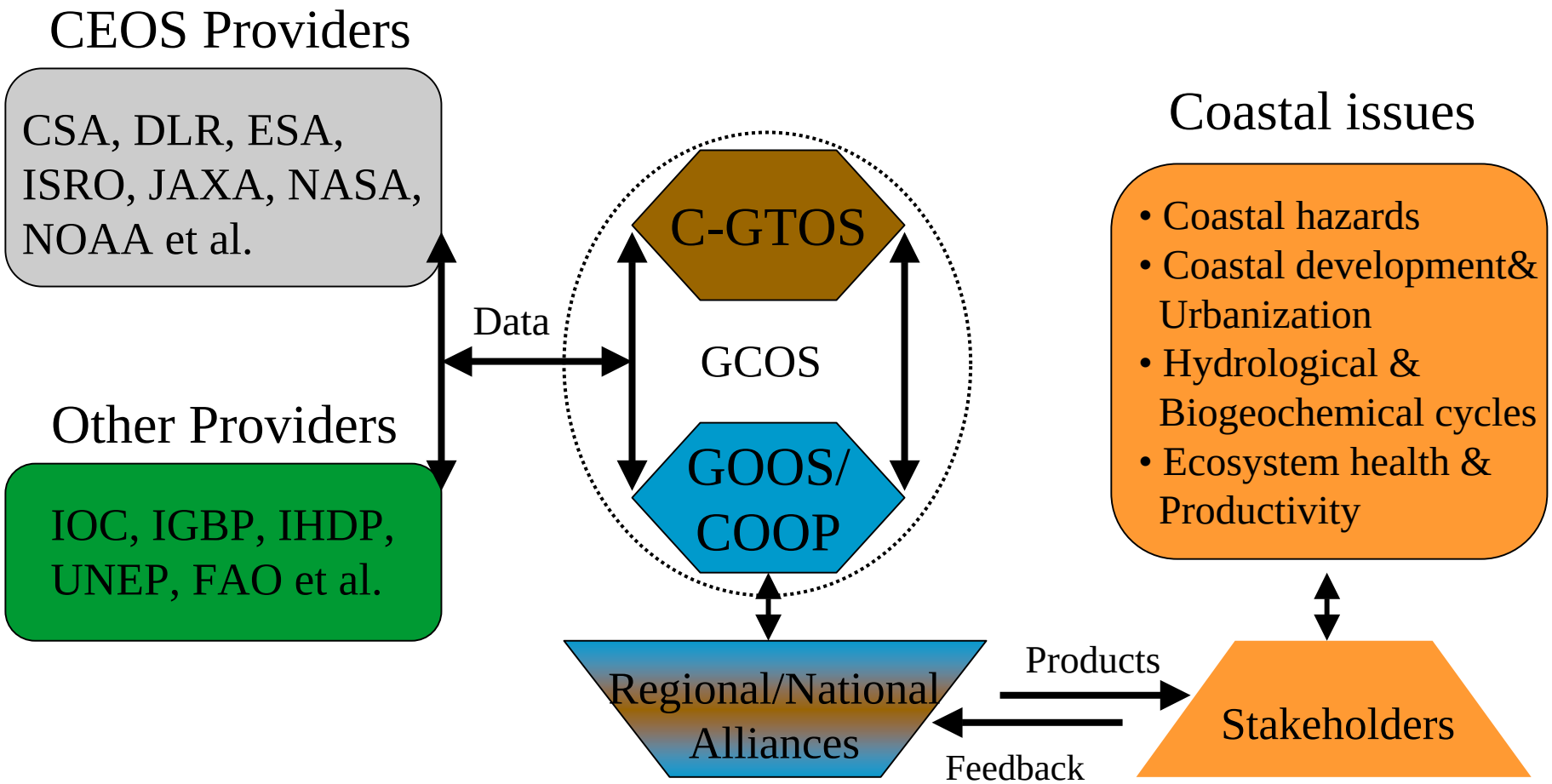
Observations	Knowledge Challenges	Resolution Challenges	Continuity Challenges
Mapping	• Need a common **habitat classification system** • Spatially explicit **socio-economic** variables	• Require high spatial res. **hyperspectral imagery** for corals and vegetation • Improve availability and use of high-res. color and lidar data for physical mapping • Access to **highest res. DEMs**	•Maintain **DMSP-OLS** for human population assessments • Maintain high-res. **multispectral optical imagers** for habitat maps
CROSS CUTTING	• Satellite CAL/VAL • Standardize & QA/QC *in situ* obs • Adaptive sampling • Power/telemetry/ biofouling issues	• require improved temporal & spatial resolution from satellite sensors • Expand coverage of *in situ* measurements	• Need to facilitate transition from research to operational satellites • Need to maintain and replace *in situ* assets

Recommended Space Agency Observing Priorities for Coastal Areas

- **PROVIDE**
  - geostationary, hyperspectral sea spectral reflectance observations of coastal areas
  - synoptic observations of coastal currents and salinity
  - higher resolution/improved coverage for ocean vector winds & SSH
  - high spatial and spectral resolution capacity to assess coral reef community changes & vegetation assessments
- **IMPROVE**
  - calibration/validation of measurements in coastal regions
  - data management infrastructure (near-real time delivery; climate data records)
- **SUPPORT** development of a Coastal Data Assimilation Experiment (CODAE)
- **FACILITATE** international efforts to blend high-resolution multi-sensor data products
- **ENSURE** access to highest resolution DEM as soon as possible

Integration Challenges	Integration Strategies
Communication: Biases in disciplines & applications	• **Interdisciplinary** training **programs/workshops** > Prioritizing interdisciplinary observation products
Data Access & Management •What data is available? •Data sharing across national boundaries •Fully "dry" land & Fully "wet" ocean data/models; separation of remote and *in situ* data	• **Coordinated** cataloguing, archiving & distribution of current and historical coastal datasets & metadata; potentially leveraging the **GTOS-TEMS** database • **Improve Data Management Infrastructure** to store, (re)process and disseminate expanding data streams, incl. (near) real-time & climate data records • **Modeling & data assimilation** => ***CODAE***
Unique Challenges •Mapping the coast •Scale dependent attributes •People at coastal interface	•**Tidal monitoring, hydrodynamic models + Vertical datum transformation tool** •**Long term time series and data continuity** •**Data integration** > Land & sea; humans & ecosystem => **Coastal GIS**

Institutional Arrangements



Implementation Schedule: Key Elements

2005	• Finalization and printing of Coastal Theme Report. • Establishment of Coastal Theme Implementation team • Workshops: CODAE; Integration of Socio-Economic data
2005-2007	• Joint oversight mechanism between Coastal modules of GOOS and GTOS • Design CODAE Pilot Project • Support development of platforms/sensors with CEOS
2007-2010	• Implement CODAE • Strengthen socioeconomic component • Revision of the Coastal Theme Report after 5 years
2010-2014	• Analysis of CODAE results • Increasing implementation of coastal observing programmes on a regional basis • Second revision of the Coastal Theme Report after 10 years

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