Coastal and Ocean Observing System Primer

http://www2.vims.edu/bridge/search/bridge1oos_menu.cfm?q=oos

Definition:

Coastal and ocean observing systems (OOS) link land-based meteorological stations, sensor-packed buoys, research vessels, undersea monitors and satellites. They measure and report important biotic and abiotic data to computers and the internet, making the data available in real-time or archived collections. Scientist and educators are actively planning and coordinating the incorporation of information from these systems into education and outreach programs. These educational products bring authentic, current research into classrooms worldwide, strengthening, enriching, and potentially revolutionizing science curricula.

Practical Applications of Ocean Observing Systems:

– Long-term scientific monitoring
– Better weather prediction
– Emergency management
– Search & rescue
– Commercial shipping
– Oil spill response
– Fishing and vacation/beach "nowcasting"
– Formal and informal education

Components of Ocean Observing Systems:

Buoys

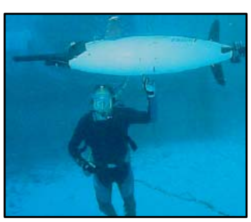
Typically sensor-packed, both above and below the sea surface, more and more buoys are coming on-line every day. The number of buoys in the coastal U.S. (including the Great Lakes) is estimated in the mid to upper hundreds. Sensors usually include air and water temperature, conductivity/salinity, current speed and direction, solar radiation, chlorophyll, turbidity, and dissolved oxygen.

Satellites

Satellites are used to measure sea surface temperature, sea surface altimetry, and ocean color from far above the water's surface. Because these satellites are continually passing overhead, they provide high resolution data many times a day.

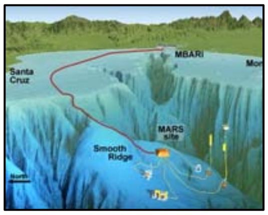
High Frequency (HF) Radar

Originally developed in the U.K. in 1938 to detect enemy planes, for which it proved unsuccessful, HF radar is now used to measure sea surface current speed and direction (and potentially wave height) up to a few hundreds of kilometers off shore.



Autonomous Underwater Vehicles (AUVs)

AUVs are free-moving underwater research vessels. Gliders (*seen at right*) use density and wings for forward motion, whereas some AUVs use propellers and rudders (*such as* Fetch I, *seen at left*). AUVs are able to sample the water column with high resolution and can be controlled from land, greatly reducing risk, costly ship time, and time away from family. Although only a few feet in length, AUVs can be packed with sensors, measuring anything from salinity and temperature to chlorophyll; some can even identify fish.



Cabled Seafloor Observatories
Using land-connected nodes, a system is set up where a constant stream of power is sent to the infrastructure, while data is constantly being sent back to land. This allows for greater freedom in placing equipment with high power demands, and can serve as a docking station for AUVs where data can uploaded and batteries can be recharged.

Meteorological Instruments
Probably the most prevalent type of observatory, meteorological arrays are capable of measuring air temperature, wind speed and direction, solar radiation, and more.

Ships of Opportunity
Scientists are now utilizing the many ships at sea, including cargo ships, tankers, ferries, and even cruise liners, by outfitting them with sensors including the standard suite of air and water quality sensors, but also sky imagers, precipitation sensors, wind and current profilers, ceilometers, webcams and more.

USGS Well & Stream Gauges
The United States Geological Survey (USGS) currently maintains over 1.5 million gauges in all 50 states, the District of Columbia, and Puerto Rico. While most collect only basic water quality data such as gauge height and stream flow, many report these parameters and several more, including temperature, specific conductance, pH, nutrients, pesticides, and volatile organic compounds, in real-time.

Web Cams
Perhaps the most empirical form of coastal and ocean observing, web cams are turning up everywhere. Conditions can be monitored visually and described qualitatively, and depending on what is seen (e.g. fishes, wave period), quantitatively.

Resources:

- **Bridge OOS Depot ‹http://www2.vims.edu/bridge/search/bridge1oos_menu.cfm?q=oos›**
- Argo Profiling Floats ‹http://www.argo.ucsd.edu/›
- NOAA National Data Buoy Center (NDBC) ‹http://www.ndbc.noaa.gov›
- Monterey Accelerated Research System (MARS) ‹http://www.mbari.org/mars/›
- Paynter Labs Webcams at the University of Maryland ‹http://www.life.umd.edu/biology/paynterlab/video/webcam.html›
- Rutgers Coastal Ocean Observation Lab (COOL) ‹http://marine.rutgers.edu/cool›
- University of Miami Rosenstiel Labs Aboard *Explorer of the Seas* ‹http://www.rsmas.miami.edu/rccl/›
- Virginia Estuarine& Coastal Observing System (VECOS) ‹http://www.vecos.org›
- Virginia Institute of Marine Science (VIMS) Autonomous Systems Laboratory ‹http://www.vims.edu/bio/assets/ASLflyersmall.pdf›

For more information on observing system and integrating OOS data into your classroom, contact Chris Petrone, Virginia Sea Grant Marine Education Specialist, at petrone@vims.edu.