

Fast Preview

Note: This is not exactly what the published abstract will look like

A Smart Sensor Web for Ocean Observation: Integrated Acoustics, Satellite Networking, and Predictive Modeling

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In many areas of Earth science, including climate change research, there is a need for near real-time integration of data from heterogeneous and spatially distributed sensors, in particular in-situ and space-based sensors. The data integration, as provided by a smart sensor web, enables numerous improvements, namely, 1) adaptive sampling for more efficient use of expensive space-based sensing assets, 2) higher fidelity information gathering from data sources through integration of complementary data sets, and 3) improved sensor calibration. The specific purpose of the smart sensor web development presented here is to provide for adaptive sampling and calibration of space-based data via in-situ data. Our ocean-observing smart sensor web presented herein is composed of both mobile and fixed underwater in-situ ocean sensing assets and Earth Observing System (EOS) satellite sensors providing larger-scale sensing. An acoustic communications network forms a critical link in the web between the in-situ and space-based sensors and facilitates adaptive sampling and calibration. After an overview of primary design challenges, we report on the development of various elements of the smart sensor web. These include (a) a cable-connected mooring system with a profiler under real-time control with inductive battery charging; (b) a glider with integrated acoustic communications and broadband receiving capability; (c) satellite sensor elements; (d) an integrated acoustic navigation and communication network; and (e) a predictive model via the Regional Ocean Modeling System (ROMS). Results from field experiments, including an upcoming one in Monterey Bay (October 2008) using live data from NASA's EO-1 mission in a semi closed-loop system, together with ocean models from ROMS, are described. Plans for future adaptive sampling demonstrations using the smart sensor web are also presented.

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