Special Guest Lectures

Coastal Modeling in the 21st Century: A problem in probability and statistics

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Abstract:
Some of the biggest challenges facing coastal scientists stem from the national need for better science combined with remarkable advances in sensor technology, wireless telemetry and the Internet that collectively allow scientists to observe the coastal environment in real time. As a result of technology advances, regional coastal ocean-observing systems around the U. S. (e.g., www.GoMOOS.org) routinely generate and integrate data streams from a variety of different data systems and organizations. While most of these systems measure physical characteristics (e.g., wind, temperature, salinity and wave height), the most sophisticated systems also measure chemical and biological properties, including populations of organisms. But the real value lies in the ability to turn these observations into predictions, and then to support practical applications that range from hazard planning to ecosystem-based resource management. In the GoMOOS experience, the best prediction has limited value unless it includes an estimate of reliability, and herein lies the problem. Producing the most likely outcome with a single prognostic model calculation is hard enough for interdisciplinary models that combine physics, biology and chemistry. To estimate reliability of the most likely outcome requires additional predictions of the probability distribution associated with the range of plausible outcomes. Thus, for some practical applications, the challenge of coastal modeling becomes an urgent problem in probability and statistics, with potentially huge requirements for high performance computing. Inverse methods provide one way to address the unavoidable consequences of uncertain models and insufficient measurements. This methodology for scientific hypothesis testing can also be used to meet societal needs for reliability estimates and better science. This talk uses specific examples from coastal New England to introduce some of the challenges and to propose potential solutions.

Speaker's Bio:
Dr. Bogden is CEO of GoMOOS, the Gulf of Maine Ocean Observing System. GoMOOS, Inc. is a nonprofit membership organization, and a regional component of a national program designed to bring hourly oceanographic data to all those who need it. He leads several projects that will augment GoMOOS by establishing new levels of interoperability and integration between other regional systems like GoMOOS, as well as state and federal agencies that collect their own information about the coastal ocean. The goal is an integrated set of interoperable and distributed observing systems producing top quality data and information products for both research and practical applications. For data integration and product services, GoMOOS is implementing and helping to advance open standards developed by the World Wide Web Consortium, the Open Geospatial Consortium. Dr. Bogden also serves as Acting Director of a major coastal science initiative at the Southeastern Universities Research Association (SURA) called the SURA Coastal Ocean Observing and Prediction (SCOOP) Program. The SCOOP vision is a shared and open-access IT infrastructure that will advance the science of environmental prediction and hazard planning for our nation's coasts. SURA partners are creating a modular, real-time prediction system that involves a network of distributed and shared resources of all kinds, including ocean observations, computer models, supercomputers and digital libraries. The goal is a virtual organization of research universities working with public and private sector partners on a robust, distributed and integrated IT infrastructure. Previously, Dr. Bogden held faculty positions at Yale University and The University of Connecticut. He obtained his PhD from Scripps Institution of Oceanography and his research specialities include coastal oceanography, inverse modeling and high performance computing.

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