IMAGe Seminars

Institute for Mathematics Applied to Geosciences at NCAR

Data Assimilation Research Projects at the Institute of Statistical Mathematics (ISM): Applications to the atmosphere-ocean coupled system, the magnetosphere, and the tsunami

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Title: Introduction to Prediction and Knowledge Discovery Research Center (PKDRC) at the Institute of Statistical Mathematics (ISM), and Data Assimilation Research Group at PKDRC/ISM

Prediction and Knowledge Discovery Research Center studies the statistical modeling and inference algorithms to extract useful information from a huge amount of data which complex systems have produced, and thus attacks to solve real world problems in a wide variety of scientific domains, in particular, genome, earth, and space sciences. Data Assimilation Research Group aims at developing an advanced and new data assimilation technique to combine different information from a dynamical simulation and observation data.

Title: Sea surface height assimilation into a coupled atmosphere-ocean model with the ensemble Kalman filter and smoother

I present an application of the ensemble Kalman filter (EnKF) and smoother (EnKS) to an intermediate coupled atmosphere-ocean model by Zebiak and Cane [1987], into which the sea surface height (SSH) anomaly observations by TOPEX/POSEIDON (T/P) altimetry are assimilated. Smoothed estimates of the 54,403 dimensional state are obtained from 1981 observational points with 2048 ensemble members. While assimilated data are SSH anomalies alone, the estimated sea surface temperature (SST) anomalies reproduce actual SST behaviors as a whole. The smoothed estimate of the zonal wind anomalies is also consistent with the observation except for the westerly anomalies in the western Pacific.

Title: An application of the particle filter to magnetospheric physics

The particle filter can essentially be applied to any situations, even if the model contains high non-linearlity or the dimension of a state vector is extremely large. We utilize the particle filter to assimilate energetic neutral atom (ENA) data remotely observed by the IMAGE satellite into a physical model of the inner magnetosphere. We will show that this assimilation technique is useful for investigating the global dynamic structure of the ring current and the electric potential which can not be obtained by in-situ measurements.

Title: Particle filter method for tsunami assimilation with shallow-water equations model

We demonstrate numerical experiment results of sequential data assimilation of tsunami. The main part of this work is correction of erroneous bottom topography. The motivation is that correction of bottom topography gives more appropriate result of tsunami simulation and precise prediction. Under this framework, bottom topography and tsunami height are corrected as update of tide gage data. Tsunami simulation model is based on shallow water equations and used data set is tide gage data. Assimilation method is the Particle Filter (PF) which can manage nonlinearity naturally. To test the effectiveness of this framework, two identical twin experiments are conducted. In this experiment, true topography is identified whenever false bottom topography is given initially.

Main Seminar Room, Mesa Lab
Thursday, June 22, 2006
1:30 – 3:30pm