1 Introduction

Computerized databases of environmental parameters, available either on the Internet or on CD-ROM, have become critical tools to understand problems related to the earth system and to climate changes. These data sets, collected through a variety of methods, including satellite sensors, ships, aircrafts, sounding balloons, and land-based stations, are now providing a global coverage of the earth. However, interpreting these measurements and understanding their limitations are often delicate. Introducing senior students to these new tools has become a necessity. This course will be available to senior students meeting the prerequisites, and will be a required course for all Global Environmental Science majors.

2 Purpose of course

The main objectives of this course will be to expose students to state-of-the-art global earth system databases, to review the instrumentation used to collect the data, to introduce them to relevant geostatistical analysis methods, and to prepare them to use these techniques in their own research or career. To that effect, lectures on the techniques of environmental data collection will be given, students read and discuss key papers in the field, and conduct small research projects working on computerized data sets.

Additional objectives are to train students with the Unix operating system, html formatting and data analysis and display using Matlab. All projects will be run on the department computers (running Linux), and output will be posted to students’ web pages. In addition, students will learn to evaluate and debate scientific concepts, and to formulate and test their own hypotheses in the course of their projects. These additional objectives are emphasized as they constitute an important training for the senior research paper required for the proposed Bachelor of Science in Global Environmental Science degree.

3 Organization

The class will consist of twice-weekly 1.5-hour sessions, with (approximately) one day devoted to lectures, and one day to lab sessions where students can work on computers under the direction of the professor. The students will have access to the computer facilities of the University of Hawaii School of Ocean and Earth Science and Technology, and the course will use the Marine Sciences computer teaching laboratory. An extensive library of CD-ROMs containing a variety of global data sets will be made available. All data sets are clean and calibrated into scientific units, so that the students’ research projects can be completed during the course of the semester.

4 Credit and level

This will be a 3 credit course, with approximately 90 minutes/week of lecture and discussion, and 90 minutes/week of supervised laboratory. It will be taught at the 300 level. It could be taught as a writing intensive course, should the need or opportunity arise. Prerequisite: MA 232, consent of instructor.

5 Evaluation

Students will be evaluated on weekly homework assignments (30%), two in-class exams (30%), and a final exam (30%). Class participation will also be taken into account.
6 Course schedule

Introduction and background
Jan 12: Establish computer accounts, review unix operating system
Jan 14: Continue review of unix
Jan 19: Overview of scripting
Jan 21: Introduction to html, web page development
Jan 26: Linear algebra
Jan 28: Introduction to Matlab
Feb 02: Matlab plotting

In-situ measurements: time-series
Feb 04: Time-series: sea level network (UHSLC)
Feb 09: Time-series: Hawaii Ocean Timeseries (HOT)
Feb 11: Time-series: Hawaii Ocean Timeseries (HOT)
Feb 16: Interannual variability, ENSO
Feb 18: Time-series: Tropical Atm/Ocn Array (TAO)
Feb 23: Velocity measurements, ADCP
Feb 25: Time-series: ADCP

Mar 02 First exam

Remote (satellite) measurements
Mar 09: Sea level (TOPEX)
Mar 11: Sea level (TOPEX)
Mar 16: Sea surface temperature (AVHRR)
Mar 18: Sea surface temperature (AVHRR)
Mar 23: Spring Break
Mar 25: Spring Break
Mar 30: Surface winds (SCAT)
Apr 01: Ocean color (SeaWiFS)

Apr 06 Second exam

Numerical Models
Apr 08: Ocean models (SODA)
Apr 13: Climate models (IPCC)
Apr 15: Time series analysis (trends)
Apr 20: Time series analysis (regression)
Apr 22: Holiday
Apr 27: Climate analysis
Apr 29: Correlations
May 04: Last day of instruction (review)

May Final Exam (TBA)