P1.29 AN INTERDISCIPLINARY FIELD COURSE IN MARINE AND ATMOSPHERIC SYSTEMS

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1. INTRODUCTION

The Florida Institute of Technology (FIT) Department of Marine and Environmental Systems (DMES) offers an interdisciplinary Field Projects course each summer for students entering their senior year. The Field Projects provide students with hands-on experience with scientific data collection, hypothesis testing and the process of taking a project from conception to completion. The program emphasizes principles of quality assurance, teamwork, planning, leadership, peer review and oral and written communication skills.

2. RESEARCH SCIENCE AREAS

The Summer 2005 Field Projects featured the following science areas for students in oceanography, environmental science, and meteorology:

1) atmospheric and water quality monitoring
2) submerged aquatic vegetation,
3) sea breeze meteorology, and
4) beach profiling.

Students are required to participate in all research areas which builds on the interdisciplinary theme of the course. Research results presented by the students at the Field Projects Symposium may even be in a science area outside of their major.

Project science areas vary in content from year to year depending on faculty/staff availability but there is year to year continuity. Meteorological studies have included themes of renewable energy (e.g. wind power in coastal zones) while marine studies may focus on measurements over the Indian River Lagoon during some years and over the Atlantic Ocean in others.

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3. DEVELOPONG HYPOTHESES

During the spring semester prior to the Summer Field Projects course, students take a prerequisite course which introduces them to the Field Projects research areas. Students develop hypotheses for each of the areas of study which may mature into testable hypotheses used during the field data collection phase of the course. Collaboration with scientists from disciplines in the various project areas begins during this course and continue into the summer program.

The hypotheses developed by the students range in degree of independence from their project mentors. Hypotheses are also influenced by logistics such as the length of period of study, the availability of instrumentation and/or data sets, and by the ability of mentors to adapt their respective field project data collection activities to accommodate outstanding/novel hypotheses by the students. Thus, the students learn the process of developing hypotheses in a realistic scientific environment in which the issues of limited resources and other constraints must be considered.

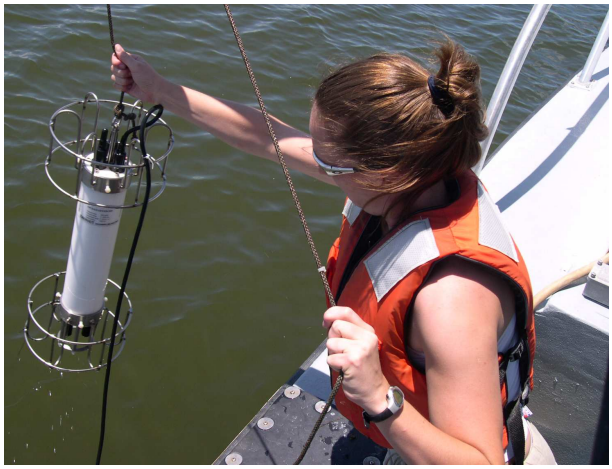

Figure 1: Monitoring sea water conductivity, temperature and depth with a "CTD" as part of the Ocean Cruise component of the Field Projects course. Students learn to operate a wide variety of instrument systems for marine and atmospheric measurement.

4. FIELD DATA COLLECTION, ANALYSIS, AND CROSS-CUTTING THEMES

The schedule of the field data collection phase for the individual research areas reflects a balance between data collection requirements across research areas that had sampling intervals ranging from daily to weekly. Also, students rotate in/out of the "land based" projects to participate in the ocean cruise studies (discussed in section 5). The schedule is rigorous, and requires effective time management by the students. The field data collection occurs during the first 8 weeks of the course.

Particular effort was spent on integrating science themes common to the four science areas. On a weekly basis, during the field data collection phase of the course, students were given assignments to analyze and/or graph preliminary data from the week's field activity. Discussion of data analysis results from the previous week led off each week and brought in perspectives from faculty with expertise in different science areas.

Figure 2: A Haglöf 3-Thread Increment Borer, 14 inches in length with a 0.169 inch diameter, Teflon®- coated bit, was used to retrieve core samples from trees on the Florida Tech campus and used in a study of tree ring growth and precipitation.

Cross-cutting themes were also addressed at the level of the research projects. For example, using meteorology as a cutting theme, the following were addressed in the other Field Project science areas:

* air quality sampling was adjusted (ozone and particulates) in order to resolve the sea breeze diurnal cycle which required finer temporal sampling.

Figure 3: Sea breeze study field data collection included measurements of surface wind speed and direction, downwelling solar radiation, and cloud base temperatures from an infrared thermometer in the vicinity of the sea breeze front.

* water quality monitoring addressed issues related to storm run off, the daily and seasonal variability in wind speed as well as longer time scale correlations between rainfall and tree ring growth.

* beach profiling included collection of ancillary weather information (especially wind information for sand transport) and other in-situ data to examine beach renourishment on natural and renourished beaches.

Figure 4: Using differential leveling surveys and determining sand grain-size distribution (not shown), the changing nature of beaches from the dune crest into the surf zone is documented.

Figure 5: Laboratory work included measurement of total suspended solids in water - which affects water clarity. The resuspension of bottom sediments by the wind has an important effect on seagrass health in the Indian River Lagoon.

5. THE OCEAN CRUISE

Students plan and participate in a 4-day science-based cruise on the Delphinus (a 60-foot near-shore research vessel) investigating processes in the Indian River Lagoon and the Atlantic Ocean. The ocean cruises have focused on the following science areas:

* Near shore oceanic circulation patterns
* Phytoplankton and zooplankton
* Fish surveys
* Marine meteorology
* Tidal dynamics near inlets
* Instrumentation testing

The ocean cruises during the summer of 2005 included studies on sources of fresh ground water seeps into the Indian River Lagoon (IRL), and temperature and salinity profile variations in the IRL in regions with varying tidal influence.

6. A RESPIT

After the field data collection period, the students are provided a well earned break from the high intensity pace of the preceding two months with a snorkeling trip in the Key Largo region followed by tours of both General Oceanics (engineering and manufacturing of water and air sampling and analysis products) and the National Hurricane Center (tropical cyclone prediction).

7. COMMUNICATING RESULTS

Students are required to communicate their results in a variety of ways. All students are required to write reports to the faculty who supervise the individual research areas. Students are also required to submit a final report which represents a compilation of the reports throughout the summer.

The course culiminates with the Field Projects Symposium. Students focus on one of their summer research projects and are required to create a poster presentation and give an oral presentation. The Symposium is open to the public and includes participation by the president of the university and scientists in their field of study. The Symposium provides students with an experience that they are likely to encounter in their professional careers. Many of the investigations are of great interest to local government agencies (including the Melbourne National Weather Service Forecast Office) and the public. Reporters interview students and present their research results in the local media.

Figure 6. FIT student Jaclyn Shafer presenting her research entitled "Verification of the ARPS model forecast of sea breeze related cloud systems" at the Summer 2005 Field Projects Symposium.

8. ACKNOWLEDGEMENTS

The Field Projects could not be conducted without the help of graduate teaching assisstants and the assistance of adjunct faculty and staff. Also, Mr. Bill Battin and Mr. Frank Leslie have contributed greatly to the Field Projects program.