

Applied Ocean Science Curricular Group

Joint Program Between:

Scripps Institution of Oceanography (SIO)

Mechanical and Aerospace Engineering (MAE)

Electrical and Computer Engineering (ECE)

Emphasis on Technology Applied to Ocean Science Research

AOS Research Areas

Ocean acoustics, optics, electromagnetics, geophysics, climate change & impacts, coastal circulation, nearshore dynamics, upper-ocean physical processes, air-sea interaction

Development and use of novel technologies, e.g., underwater sensors, autonomous undersea vehicles, satellite sensors.



Downed WWII Aircraft
Missing for 72 Years Located
By Project RECOVER
Eric Terrill and colleagues

AOS Program Learning Objectives

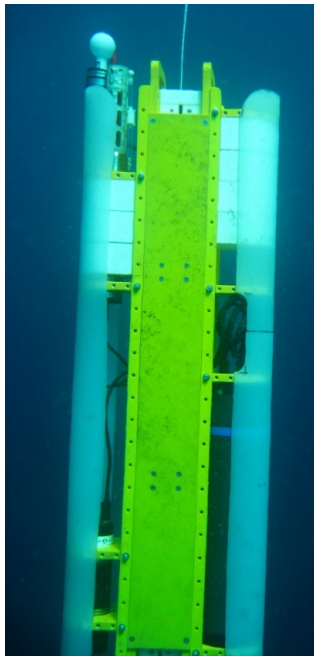
- apply and integrate information from core subjects in oceanography including physical oceanography, biological oceanography, marine chemistry and marine geology
- demonstrate literacy in oceanic physical principles such as: fluid dynamics, ocean waves, acoustic waves, seismic waves and optical waves.
- demonstrate familiarity with oceanographic data collection and sensors
- participate in at least one seagoing expedition
- demonstrate familiarity with oceanographic data processing including concepts of signal processing and algorithm development.

AOS Program Course Requirements

- *Wave Physics sequence: Ocean, Acoustics, Optics, Seismic waves (Yr 1)*
- *2 of 4 SIO core courses: Biological Oceanography, Physical Oceanography, Marine Chemistry, Marine Geology (Yr 1)*
- *1 math and 1 data analysis class (Yr 2)*
- *2 additional technical courses prior to the qualifying exam (~end of Yr 3)*
- *Additional coursework in the students' area of study*
- *AOS Seminar (SIOC 208)*

Physical Oceanography and Fluid Mechanics

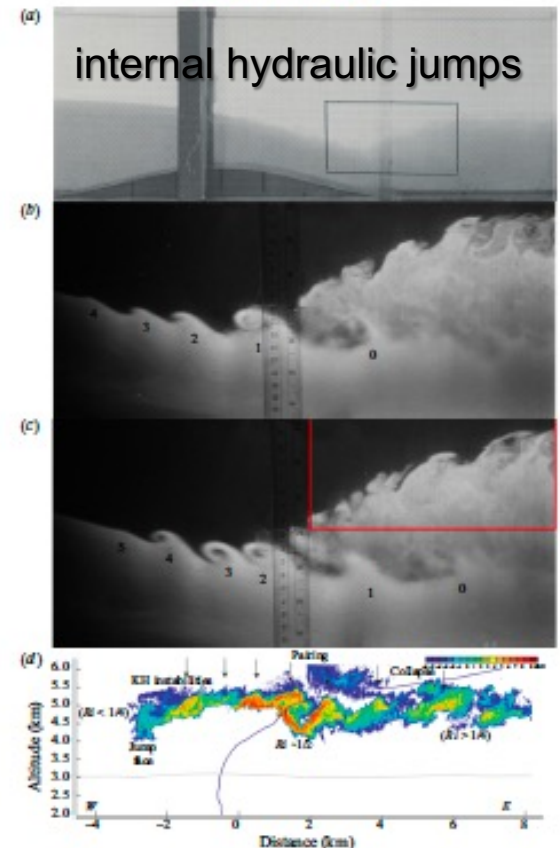
A. Waterhouse, J. Mackinnon, M. Alford, D. Lucas, L. Armi, G. Pawlak



Wire Walker

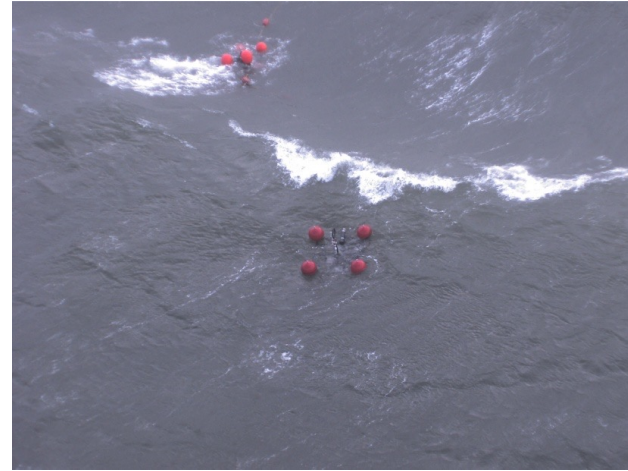
- Ocean turbulence and mixing
- Internal waves, surface waves, wave generation, and wave breaking
- Interactions between waves, currents, bottom topography
- Air-sea interaction and air-sea fluxes
- Ocean observation techniques, instrumentation, sensors

G.A. Lawrence and L. Armi



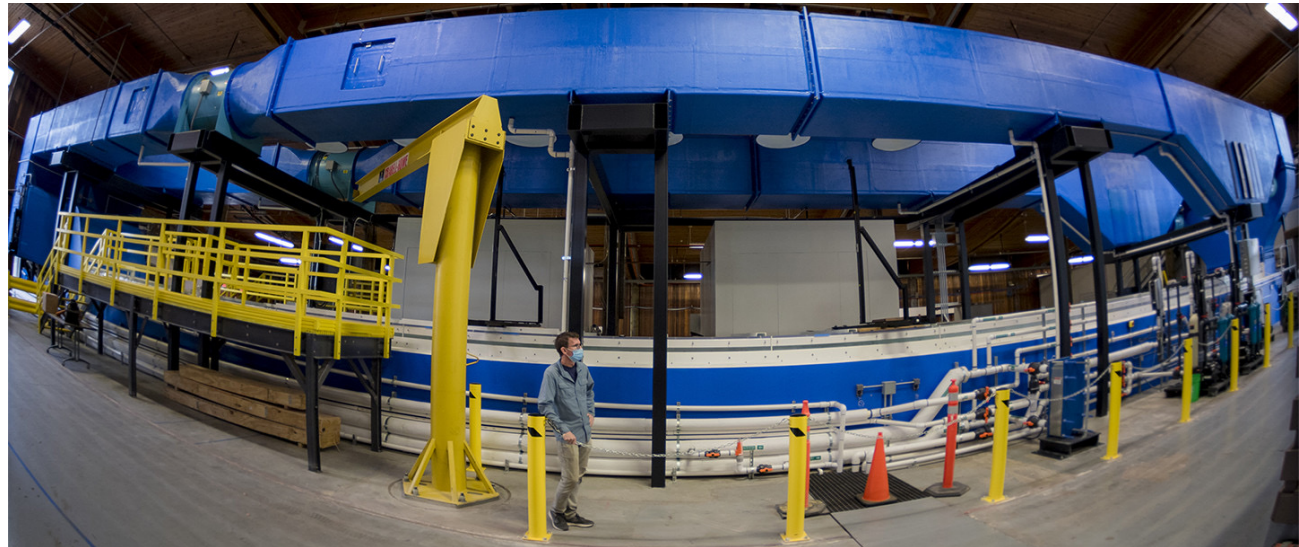
Air-Sea Interaction

Grant Deane & Dale Stokes



Surface image showing the imaging frame and a whitecap

Breaking waves and the role of bubbles in air-sea gas transfer, aerosol production, ambient noise generation, and glacier monitoring



Scripps Ocean Atmosphere Research Simulator, or SOARS

Coastal Observing Research and Development



Eric Terrill and Sophia Merrifield

New ocean technology

Vehicles

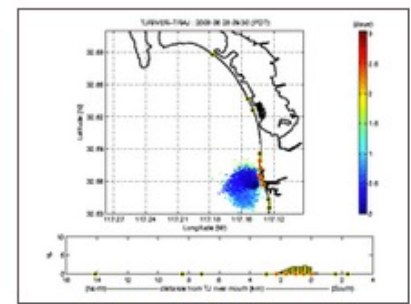
Fusion of data improved decision making



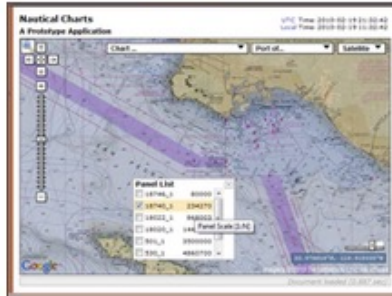
National Surface Current Mapping Data Network



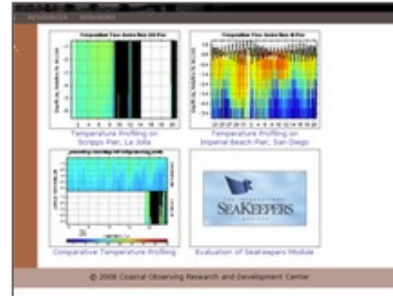
Global Surface Current Mapping



Tijuana River Plume Tracking



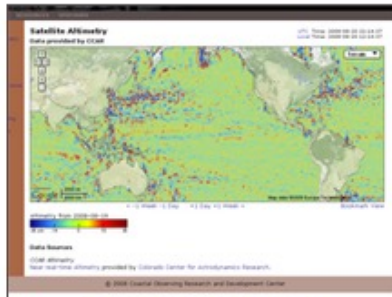
NOAA Raster Navigation Charts



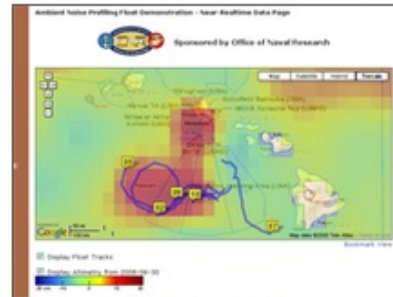
Pier Based Sensor Development



Hydrodynamics Experiments



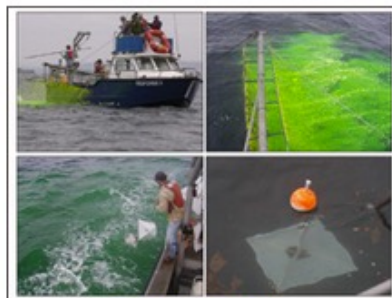
Satellite Altimetry (CCAR)



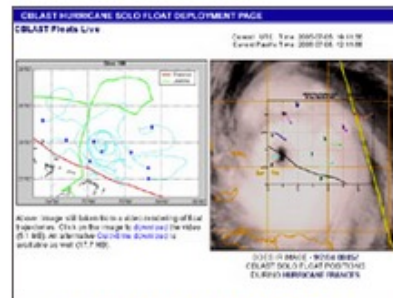
RIMPAC - 2008



Buoys & Moorings



Oil Spill Tracking



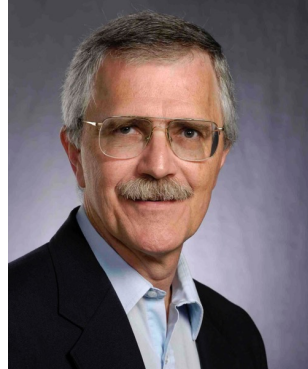
Autonomous Hurricane Profilers



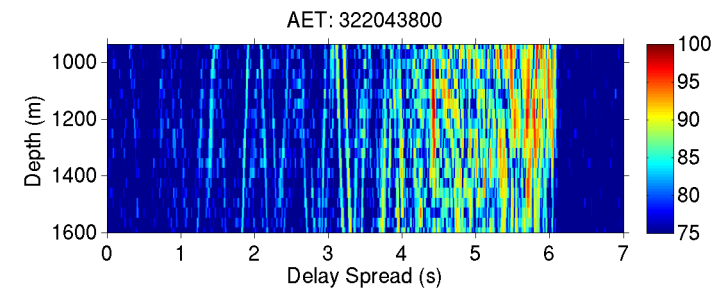
Southern California Coastal Ocean Observing System

Ocean Acoustics

W. Kuperman, W. Hodgkiss, H. Song



- Ocean acoustic propagation
- Interaction with the surface and bottom
- Spatial distribution and characterization of ambient ocean noise
- Inversion and time reversal acoustics
- Sediment acoustics and inversions for sediment geoacoustic properties
- Digital signal processing and Array Processing
- Acoustic communications



Ocean Optics – Dariusz Stramski, Rick Reynolds

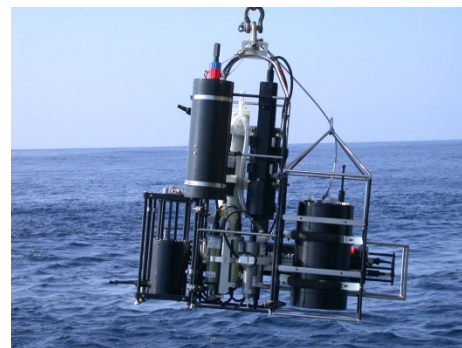
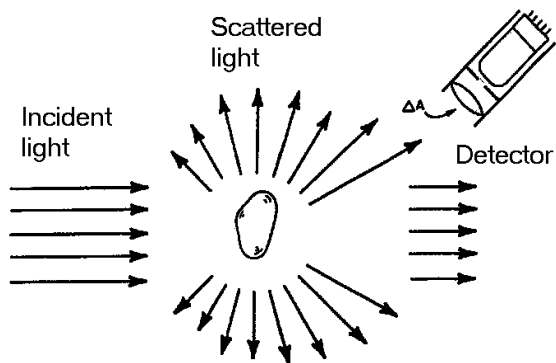


FIELD WORK AND OPTICAL REMOTE SENSING

Field experiments: Polar oceans, Atlantic, Pacific, coastal marine environments

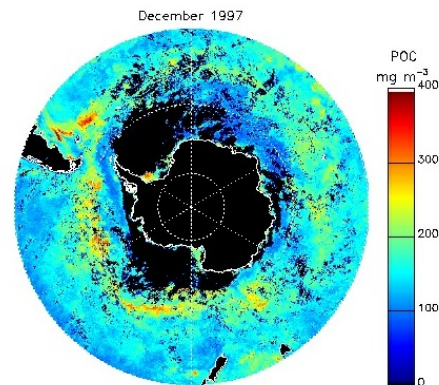
BASIC RESEARCH ON PARTICLE OPTICS

Light scattering and absorption by particles, laboratory experiments and modeling



Satellite ocean color algorithm development and applications:
Satellite-derived particulate organic carbon

RADIATIVE TRANSFER AND INVERSE OPTICAL MODELING



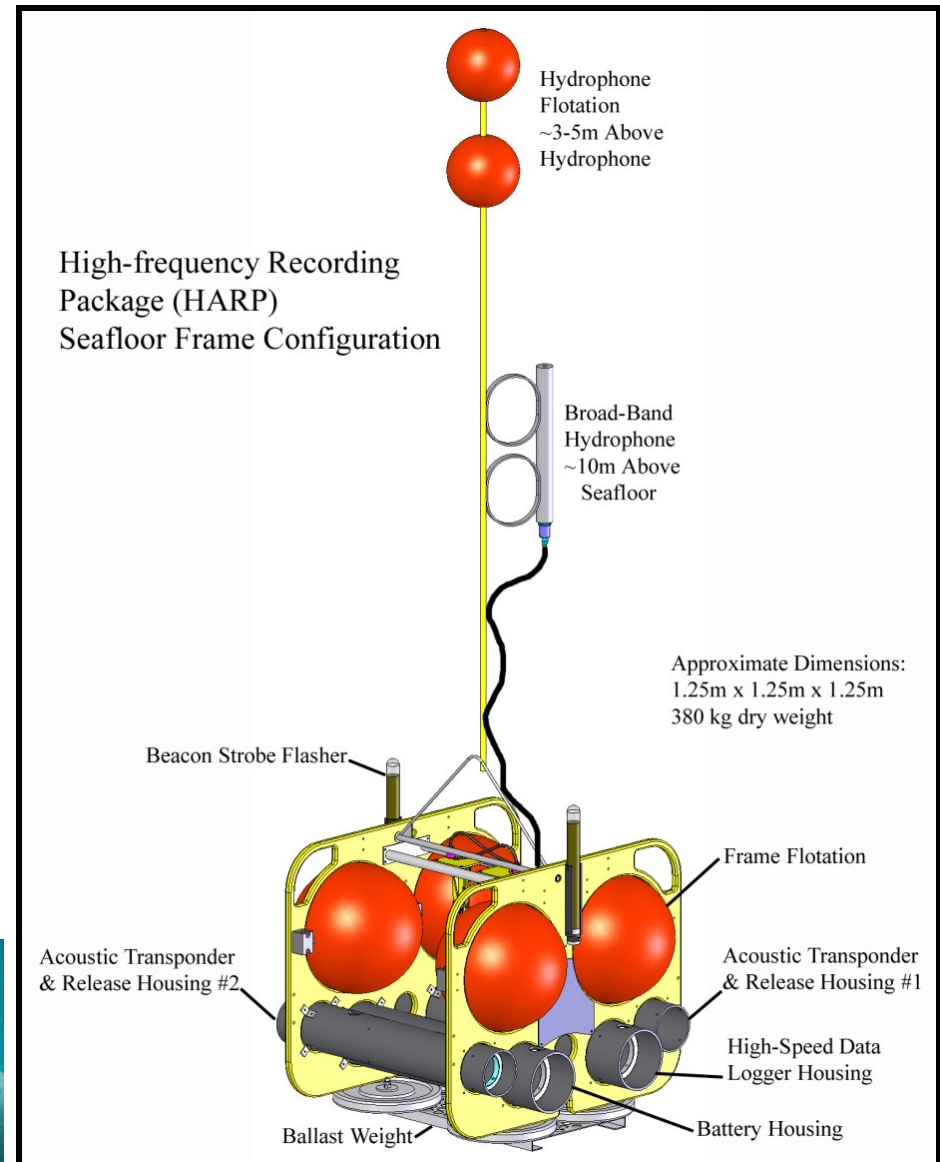
Marine BioAcoustics and Underwater Noise

J. Hildebrand, S. Wiggins, K. Frasier



Research Objectives:

- 1) Marine Mammal Monitoring
- 2) Anthropogenic Sounds from Ships, Sonars, and Seismic
- 3) Ocean Ambient Noise
- 4) Machine Learning for detection and classification



The Coastal Processes Group

- improve understanding of physical processes over broad temporal and spatial scales;
- advance models for assessing and predicting coastal change;
- assess coastal climate change impacts;
- determine the effectiveness of coastal resilience projects.



AOS Departmental Exam

- *AOS departmental examination at the end of the first year*
- *Based on SIOC 202A–B Wave Physics, and two of the four core courses (chosen by the student)*
- *Written component on SIO202A-B*
- *Oral component on core classes and SIO202A-B*