

SIOC 218A: Observational techniques in physical oceanography

Instructor: Uwe Send

Credits: 4

Time: one 80min lecture each week, plus discussion sessions, plus 2 days at sea

Goals/methods:

- Learn currently used methods and instruments
- Understand principles of observation/technique
- Learn about instruments/techniques for ship work
- Learn ship/deck skills
- Become critical of limitations, errors, suitable applications for techniques/instruments
- Ability to judge/choose method/instrument of choice
- Tradeoffs in capability, cost, deployment modes
- Practical advice (common errors, things often overlooked)
- Learn about existing programs supporting types of observations, sources of data
- Design of own sampling, data collection, or analysis

Content:

Introduction/Overview/Organization

Coordinate Systems

Projections, geodetic reference systems/ellipsoids, distance measurement, directions (compass, deviation, Schuler-oscillations)

Determining position

Terrestrial position fixes, radio position fixes, satellite techniques (GPS, DGPS, directional GPS, Galileo, etc), acoustic positioning, geodetic moorings

Depth measurements

Water depth (echosounder, errors, sweeping echosounders, altimetry), depth of instruments (via pressure or acoustically)

Platforms (including capabilities/limitations, cost, endurance, etc)

- Ships
- Towers
- Drifting platforms (surface or depth), GDP, ARGO
- Remotely controlled vehicles
- Autonomous platforms (gliders, thermal, AUVs, docking), AOSN
- Moorings, mooring design, OceanSITES
- Aircraft
- Satellites

Sampling design and data presentation

Quality of data, sampling, calibrations, power calculations, data volume, data display

Temperature, salinity, pressure and bottom pressure measurements

- Thermometer, T-sensors, units
- Conductivity sensors, salinometer, units
- Pressure sensors, bottom pressure, gravity remote sensing
- CTD, XBT, XCTD, moored/drifted sensors, yoyo

2 classes

2 classes

2 classes

- Water sampler (slippage etc)

Current measurements

- Eulerian (rotor current meters, VACM, VMCM, E&M, acoustic and doppler, hotwire)
- Lagrangian (surface, subsurface, RAFOS, 3-D floats)
- Transient tracers

} 2 classes

Acoustic methods

- Echosounder imaging
- Doppler methods (currents, waves, ice, wind)
- Inverted echosounder
- Positioning/tracking (e.g. Pegasus)
- Passive methods (rain, wave breaking, acoustic daylight)
- Backscatter (plankton)

} 2 classes

Data telemetry and real-time observatories

} 1 class

Requirements:

Each enrolled student must

- Give a presentation about a technique of their choice
- Participate in the field work
- Pass a short oral exam at the end of the quarter

Each group must

- Analyze data from one type of measurements
- Present and discuss their results in group meetings
- Submit a short write-up of the results

Grades:

25% individual presentation, 25% oral exam, 25% data processing and analyses, 15% participation in field work, 10% contribution to final report