

*AOS 202 – Introduction to Ocean Science
Topics Winter 2016*

- 1) Measurements and Observed Patterns:
 - Ship-based measurements
 - Sediment cores (paleo-climate)
 - Autonomous platforms
 - Satellite sensors: SST, SSH, gravity, Chlorophyll, wind, salinity
 - Surface current, eddy energy, heat and water flux, and wave patterns

- 2) Physical Equations and Models:
 - Regime parameters
 - Boussinesq equations and an approximation hierarchy
 - Equation of State
 - Ekman currents and Sverdrup transport
 - Meridional Overturning Circulation
 - Potential vorticity
 - Quasigeostrophy: 3D and barotropic general circulation models

- 3) Large-Scale Circulation:
 - surface fluxes of momentum, heat, and water
 - wind gyres
 - thermocline scaling and subduction
 - equatorial circulation and ENSO
 - thermohaline, abyssal, and meridional overturning circulations
 - Antarctic Circumpolar Current

- 4) Biogeochemistry:
 - surface chemical fluxes and boundary conditions
 - N/P, O, C
 - biological cycling
 - ideal age
 - dust and iron
 - global sources and sinks
 - water masses
 - chemical reactions and stoichiometry
 - general circulation and inverse models

- 5) Surface Layer Processes:
 - surface gravity waves
 - Ekman, convective, and Langmuir boundary layers
 - life in the mixed layer and euphotic zone
 - food web
 - productivity
 - light and T controls, critical depth

- enzyme kinetics
- plankton and microbes
- export
- nutrient limitation
- gas exchange
- fisheries

6) Physical Variability in the Interior:

- sound wave
- interia-gravity wave
- Rosby and QG topographic waves
- Kelvin waves at the equator and coastal boundary
- baroclinic and barotropic instability
- tropical instability wave
- mesoscale eddies
- submesoscale fronts, filaments, and eddies
- stratified turbulence and microstructure
- double diffusion
- bottom boundary layer and topographic effects

7) Climate:

- surface heat and water conditions
- paleoclimate
- decadal natural variability
- anthropogenic global change
 - warming and stratification
 - acidification
 - ecosystems and overfishing
- coupled models

8) Coastal Circulation and Ecosystems:

- tides and storm surges
- upwelling and alongshore currents
- river and estuary influences, eutrophication
- shoreline and surf-zone currents
- blooms, communities, dispersal and connectivity, marine reserves, and fisheries
- regional models