12.809 Syllabus.

Week 1: Observational Review
- -coastal marine layer and coastal gravity currents
- -deep overflows
- -outflow plumes
- -shallow exchange flows with marginal seas

Weeks 2-3: Fundamentals of hydraulic theory
- - linear waves in shallow water
- - nonlinear waves: steepening, breaking and rarefacation
- - flow over obstacles: hydraulic control, upstream influence and form drag
- - hydraulic jumps and bores

Weeks 4-6: Rotating systems:
- -Kelvin and frontal waves in channels and along coasts
- -The WLK and Gill models of deep overflows
- -Streamtube models for outflow plumes
- -Anatomy of an overflow: the Faroe Bank Channel

Weeks 7-9: Coastal Hydraulics
- -Inertial boundary currents along curvy coastlines: flow separation.
- -Coastal shock waves and bores.
- -The dynamics of the California coastal marine layer: supercritical flow, expansion fans and oblique shocks.
- -Coastal gravity currents.
- -The inertial behavior of upwelling jets and fronts: application to the Oregon coastal jet.

Weeks 10-13: Two-layer exchange flows and estuary circulation.
- -Two-layer hydraulics: maximal and submaximal control
- -Case studies: The Strait of Gibraltar and the Bab al Mandab
- -The theory of overmixing in estuaries.
- -Overmixing and maximal exchange in inverse estuaries
- -Case study: the Red Sea.

Week 14 and beyond: Project reports and TBA material as requested by students.

The text for the class is 'Rotating Hydraulics' by Pratt and Whitehead, scheduled for publication in September. Early versions of the text can be downloaded from Larry's WHOI website

http://www.whoi.edu/profile.do?id=lpratt

before publication takes place. Students in the class will carry out a project involving some new area of investigation related to hydraulic behavior. It is fine for the topic to be within the student's main research interest.