

ATM/OCE/MPO 682: Natural Hazards: Atmosphere and Ocean
Spring 2017,
M/W 1:00-2:20,
MSC 329

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Brief Description:

This special topics course is designed to provide students with an understanding of natural hazards in both the atmosphere and ocean. In the atmosphere, we will explore both weather events such as storms and hurricanes and tornadoes as well as longer term phenomena such as monsoons and excess rainfall in the tropics. Oceanographically, the course will address hazards such as storm surge and flooding, rogue waves, rip currents, and tsunamis that occur on short time scales as well as the longer term effects such as sea level rise and the impacts of El Nino and La Nina oceanographic conditions on weather conditions. Thus, the course focus is on hazards and their impacts around the globe.

1. Introduction and Observational Platforms (Weeks 1-2)

- A. Buoys (DART buoys)
- B. Ships, Aircraft
- C. Autonomous Platforms (gliders, floats, drifters)
- D. Remote Sensing (altimetry, hf radar....)

2. Hurricanes and Severe Weather at Landfall (Weeks 3-8)

- A. Anatomy of a Hurricane
- B. Physics and Thermodynamical Controls
- C. Track and Intensity Prediction
- D. Landfall
- E. Storm Surge Components (Surface Winds, Tides, Waves and Inverted Barometric Effect)
- F. Shape of Coastline and Topography
- G. Sea Level Rise and Inland Flooding

3. Other Short-Term Weather Events (Week 9)

- A. Tornadoes
- B. Winter Storms (e.g., Noreaster's)

4. Rogue Waves (Week 10)

- A. Surface Wave-Current Interactions
- B. Rip Currents

5. Tsunamis (Weeks 11-12)

- A. Forcing Mechanisms (Earthquakes)
- B. Coastal Topography
- C. Flooding
- D. Measurement Techniques for Detection

6. Longer Term Weather Events (Weeks 12-15)

- A. InterTropical Convergence Zone (ITCZ) and Precipitation Anomalies
- B. Monsoons

- C. El Nino/La Nina
- D. Western Pacific Warm Pool and Equatorial Kelvin Waves

Books (On Reserve in Library)

Hurricane Climatology: A Modern Statistical Guide Using R (Hardcover), by James B. Elsner and Thomas H. Jagger. Oxford University Press. ISBN-13: 978-0199827633 ISBN-10: 019982763X

An Introduction to Statistical Modeling of Extreme Values (Hardcover), by Stuart Cole. Springer. ISBN 1-85233-459-2

Modeling Extremal Events: for Insurance and Finance (Stochastic Modelling and Applied Probability) (Hardcover), by P. Embrechts, C. Kluppelberg, T. Mikosch. Springer.

Hazards, Risks and Disasters in Society, eds. Collins, Jayawickrama, Samantha and Manyena, Academic Press, ISBN 9780123964519

Coastal and Marine Hazards, Risks, and Disasters Edited by Jean Ellis and Douglas Sherman, Elsevier, ISBN: 9780123964830 (E-Reserve)

Hydro-Meteorological Hazards, Risks, and Disasters, Edited by Paolo Paron and Giuliano Baldassarre, Elsevier, ISBN: 9780123948465

Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes, Edited by E. A. Keller and D. E. Devecchio, Pearson Publishing Company, ISBN:13-9780321943514 (Chapters 1,4, 9-12)

Notes and selected manuscripts as assigned.

Grading:

1. Homework: 50%
2. Exam: 25%
3. Review Paper or Project: 25%