

Course Objectives: The emphasis of this class will be on the fundamental aspects of tropical cyclone structure and intensity change, with a focus on symmetric versus asymmetric processes. Through in class presentations, we will review the seminal papers in the field and follow the progress of modern tropical cyclone research to the unanswered questions of today from both an observational and modeling perspective.

Instructor: Kristen L. Corbosiero, MS 7149, 310-825-1751, kristen@atmos.ucla.edu

Credits: Variable, 2-4

Grading: S/U only (may petition to have count as qualifying elective), based on in class presentations and participation

Class hours: Tuesday/Thursday 9:00 – 10:15 am in MS 7121

Office hours: Tuesday/Thursday 11 am – Noon; Monday 2 – 3 pm

Class web site: <http://moodle.atmos.ucla.edu>

Early Composite Studies of Tropical Cyclone Structure

Thursday, September 27th

Kristen Corbosiero

Frank, W., 1977: The structure and energetics of the tropical cyclone I. Storm structure. *Mon. Wea. Rev.*, **105**, 1119-1135.

Tuesday, October 2nd

Stephanie Sullivan

Shea, D. J., and W. M. Gray, 1973: The hurricane's inner core region. I. Symmetric and asymmetric structure. *J. Atmos. Sci.*, **30**, 1544-1564.

Gray, W. M., and D. J. Shea, 1973: The hurricane's inner core region. II. Thermal stability and dynamic characteristics. *J. Atmos. Sci.*, **30**, 1565-1576.

Symmetric Intensity Change and Updated Tropical Cyclone Structure

Thursday, October 4th

Steven Van Horn

Willoughby, H. E., J. A. Clos, and M. G. Shoreibah, 1982: Concentric eye walls, secondary wind maxima, and the evolution of the hurricane vortex. *J. Atmos. Sci.*, **39**, 395-411.

Shapiro, L. J., and H. E. Willoughby, 1982: The response of balanced hurricanes to local sources of heat and momentum. *J. Atmos. Sci.*, **39**, 378-394.

Tuesday, October 9th **Sarah Kapnick**
Jorgensen, D. P., 1984: Mesoscale and convective scale characteristics of mature hurricanes. Part I: General observations by research aircraft. *J. Atmos. Sci.*, **41**, 1267-1285.

Thursday, October 11th **Edan Lindaman**
Willoughby, H. E., F. D. Marks, Jr., and R. J. Feinberg, 1984: Stationary and moving convective bands in hurricanes. *J. Atmos. Sci.*, **41**, 3189-3211.

Tuesday, October 16th **Ben Meiselman**
Franklin, J. L., S. J. Lord, S. E. Feuer, and F. D. Marks, Jr., 1993: The kinematic structure of Hurricane Gloria (1985) determined from nested analyses of dropwindsonde and Doppler radar data. *Mon. Wea. Rev.*, **121**, 2433-2451.

Thursday, October 18th **Louise Nuijens**
Willoughby, H. E., 1998: Tropical cyclone eye thermodynamics. *Mon. Wea. Rev.*, **126**, 3053-3067.

Tuesday, October 23^d **Panu Trivej**
Molinari, J., P. Moore, and V. Idone, 1999: Convective structure of hurricanes as revealed by lightning locations. *Mon. Wea. Rev.*, **127**, 520-534.

Vertical Wind Shear

Thursday, October 25th **Junhong Liang**
Jones, S. C., 1995: The evolution of vortices in vertical shear: I: Initially barotropic vortices. *Quart. J. Roy. Meteor. Soc.*, **121**, 821-851.

Tuesday, October 30th **Steven Van Horn**
Frank, W. M., and E. A. Ritchie, 2001: Effects of vertical wind shear on the intensity and structure of numerically simulated hurricanes. *Mon. Wea. Rev.*, **129**, 2249-2268.

Thursday, November 1st **Kristen Corbosiero**
Corbosiero, K. L., and J. Molinari, 2002: The effects of vertical wind shear on the distribution of convection in tropical cyclones. *Mon. Wea. Rev.*, **130**, 2110–2123.

Corbosiero, K. L., and J. Molinari, 2003: The relationship between storm motion, vertical wind shear and convective asymmetries in tropical cyclones. *J. Atmos. Sci.*, **60**, 366-376.

Tuesday, November 6th **Ka Yee Wong**
Black, M. L., J. F. Gamache, F. D. Marks, Jr., C. E. Samsury, and H. E. Willoughby, 2002: Eastern Pacific Hurricanes Jimena of 1991 and Olivia of 1994: The effect of vertical wind shear on structure and intensity. *Mon. Wea. Rev.*, **130**, 2291-2312.

Asymmetries, Instabilities and Vortex Rossby Waves

Thursday, November 8th

Junhong Liang

Kossin, J. P., and M. D. Eastin, 2001: Two distinct regimes in the kinematic and thermodynamic structure of the hurricane eye and eyewall. *J. Atmos. Sci.*, **58**, 1079-1090.

Schubert, W. H., M. T. Montgomery, R. K. Taft, T. A. Guinn, S. R. Fulton, J. P. Kossin, and J. P. Edwards, 1999: Polygonal eyewalls, asymmetric eye contraction, and potential vorticity mixing in hurricanes. *J. Atmos. Sci.*, **56**, 1197-1223.

Tuesday, November 13th

Louise Nuijens

Kossin, J. P., and W. H. Schubert, 2001: Mesovortices, polygonal flow patterns, and rapid pressure falls in hurricane-like vortices. *J. Atmos. Sci.*, **58**, 2196-2209.

Kossin, J. P., B. D. McNoldy, and W. H. Schubert, 2002: Vortical swirls in hurricane eye clouds. *Mon. Wea. Rev.*, **130**, 3144-3149.

Kossin, J. P., and W. H. Schubert, 2004: Mesovortices in Hurricane Isabel. *Bull. Amer. Meteor. Soc.*, **85**, 151-153.

Thursday, November 15th

Sarah Kapnick

Knaff, J. A., J. P. Kossin, and M. DeMaria, 2003: Annular hurricanes. *Wea. Forecasting*, **18**, 204-223.

Tuesday, November 20th

Panu Trivej

Reasor, P. D., M. T. Montgomery, F. D. Marks, Jr. and J. F. Gamache, 2000: Low-wave number structure and evolution of the hurricane inner core observed by airborne dual-Doppler radar. *Mon. Wea. Rev.*, **128**, 1653-1680.

Maximum Potential Intensity, Superintensity and Asymmetric Intensity Change

Tuesday, November 27th

Ka Yee Wong

Camp, J. P., and M. T. Montgomery, 2001: Hurricane maximum intensity: Past and present. *Mon. Wea. Rev.*, **129**, 1704-1717.

Thursday, November 29th

Edan Lindaman

Persing, J., and M. T. Montgomery, 2003: Hurricane superintensity. *J. Atmos. Sci.*, **60**, 2349-2371.

Tuesday, December 4th

Stephanie Sullivan

Montgomery, M. T., Bell, M. M., S. D. Aberson, and M. L. Black, 2006: Hurricane Isabel (2003): New insights into the physics of intense storms. Part I: Mean vortex structure and maximum intensity estimates. *Bull. Amer. Meteor. Soc.*, **87**, 1335-1347.

Aberson, S. D., M. T. Montgomery, M. Bell, and M. Black, 2006: Hurricane Isabel (2003): New insights into the physics of intense storms. Part II: Extreme Localized Wind. *Bull. Amer. Meteor. Soc.*, **87**, 1349-1354.

Thursday, December 6th

Ben Meiselman

Cram, T. A., J. Persing, M. T. Montgomery and S. A. Braun, 2007: A Lagrangian trajectory view of transport and mixing processes between the eye, eyewall, and environment using a high-resolution simulation of Hurricane Bonnie (1998). *J. Atmos. Sci.*, **64**, 1835-1856.