University of Colorado at Boulder

AEROSPACE ENGINEERING SCIENCES

Seminar

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Variability and Uncertainty in the Surface Heat and Water Fluxes over the Ocean

The atmosphere and ocean are strongly coupled through the sea surface energy balance. There have been many studies which have tried to link the generation of variability in one, the other, or both. Perhaps the most well known of these studies is the Hasselmann red noise hypothesis, a theory which links the generation of low frequency variability to the integrated stochastic forcing of the ocean by the atmosphere. Others have tried to link observed low frequency variability through dynamical teleconnection patterns which allow remote influences to propagate long distances via atmospheric "bridges" and possibly oceanic "tunnels." For both stochastic-dynamic and dynamic-thermodynamic theories, understanding the surface energy budget, how it is regulated, and how feedbacks operate at the air-sea interface is of fundamental importance. These interactions are complicated by differing time scales of response owing to the large difference in thermal capacity between the atmosphere and ocean. There is also intrinsic variability, unforced by the other, in each system. Given the myriad of processes involved on disparate time scales combined with an often inadequate observing system and theory, it becomes clear why there remains so much uncertainty in these exchange processes.

In this work we are attempting to ascertain the role that high frequency variability plays in determining the coupling of the ocean and the atmosphere through the surface heat and water flux. In this talk I will first give an overview of current global water and energy budgets and the uncertainty in the ocean-atmosphere surface fluxes. I will discuss how we determine the turbulent heat fluxes from satellite and in situ measurements, with some analyses of the variability of global ocean-atmosphere heat water fluxes. Time permitting, I will then discuss the use of wavelets to evaluate high-frequency variability and the effect of inclusion of sub-monthly time scales on feedbacks between the atmosphere and ocean, and show some initial results. I will conclude with some thoughts about current research directions that the community is heading to reduce our uncertainty in these fluxes.

Friday, April 10, 2015
2:00-3:00 PM
KOBL 330
Refreshments!

Biography:

Carol Anne Clayson is a Senior Scientist in the Department of Physical Oceanography at the Woods Hole Oceanographic Institution (WHOI). She has been tenured faculty at Florida State University and Purdue University, and while at FSU was the Director of the Geophysical Fluid Dynamics Institute as well as receiving a Developing Scholar Award. She is the recipient of an NSF CAREER award and the Office of Naval Research Young Investigator Award. She received a Presidential Early Career Award for Scientists and Engineers from President W. Clinton. Dr. Clayson is the author or co-author of over 45 journal articles, two books on air-sea boundary layers and numerical ocean modeling, two book chapters, and three National Research Council reports. She sits on external advisory boards for the University of Colorado Aerospace Engineering Sciences Department and the Los Alamos Laboratory Institute of Geophysical and Planetary Physics. Her current areas of research include understanding how air-sea interactions affect the climate scale, how the global water cycle is varying, and how the ocean responds to processes such as tropical cyclones, and she has received funding for her research from NASA, NOAA, the Office of Naval Research, and NSF. Dr. Clayson received her B. S. degree in Physics and Astronomy from Brigham Young University in 1988, and her M.S. and Ph.D. degrees in Aerospace Engineering Sciences from the University of Colorado, Boulder in 1990 and 1995.