

## **2014 NOAA-MPOWIR Internship Opportunities**

### **NOAA AOML: Global Drifter Program – Miami, FL**

#### **Primary supervisor: Rick Lumpkin**

NOAA's Global Drifter Program collects worldwide observations of surface currents and sea surface temperatures, with measurements going back to 1979 in the tropical Pacific basin. For more information, see [http://www.aoml.noaa.gov/phod/dac/gdp\\_information.php](http://www.aoml.noaa.gov/phod/dac/gdp_information.php). An intern candidate is invited to spend 8-10 weeks analyzing near-surface velocity data collected by the global drifter array, at NOAA's Atlantic Oceanographic and Meteorological Laboratory in Miami, Florida. Before arriving, the candidate will have developed a scientific analysis project utilizing these data; the intern will work at AOML in collaboration with Dr. Rick Lumpkin.

### **NOAA AOML: The international Argo project collects quasi-Lagrangian and hydrographic data in the global oceans – Miami, FL**

#### **Primary supervisors: Claudia Schmid and Molly Baringer**

The Argo Program obtains systematic global observations of subsurface ocean temperature, salinity, and circulation. These key variables describe the physical state of the ocean, including its heat and fresh water content and their transport by ocean currents, and the contribution of changes in seawater temperature and salinity to sea surface height. Over 3500 Argo floats presently provide over 120,000 ocean profiles each year (see <http://www.argo.ucsd.edu>). AOML maintains the US Argo Data Assembly Center (<http://www.aoml.noaa.gov/phod/argo/index.php>) that processes more than 50% of the world-wide floats, providing real-time quality control, submission to GTS and creation of netCDF format files for distribution by the global data assembly centers. Interns interested in using this data for a variety of ocean and climate related studies are most welcome; the candidate should contact Drs. Claudia Schmid or Molly Baringer for further details.

### **NOAA AOML: Variability of the circulation in the upper and intermediate depths of the South Atlantic Ocean – Miami, FL**

#### **Primary supervisor: Claudia Schmid**

Quasi-Lagrangian and hydrographic data collected continuously by the international Argo project as well as data of the sea surface height are available for deriving the three-dimensional field of the horizontal velocity. These flow fields can be used to analyze the seasonal to interannual variability of the circulation and perform transport calculations. Interns interested in working on the circulation of the ocean are welcome to contact Dr. Claudia Schmid.

### **NOAA AOML: South Atlantic Meridional Overturning Circulation – Miami, FL.**

#### **Primary supervisors: Drs. Renellys Perez and Shenfu Dong**

Studying the structure and variability of the meridional exchange of heat, salt and fresh water at the southern end of the Atlantic Ocean is crucial to improving our understanding of the climate system and its impacts on society. Scientists at NOAA-AOML are playing leading roles in a major international initiative to build a comprehensive, coherent, observing system for these exchanges – an initiative entitled the South Atlantic Meridional Overturning Circulation (SAMOC) program. At present our (NOAA-AOML's) contributions to SAMOC include monitoring the western boundary components of the Meridional Overturning Circulation with moored pressure-equipped inverted echo sounders, conducting trans-basin expendable bathythermograph (XBT) and conductivity-temperature-depth (CTD) sections, analyzing numerical ocean and coupled climate models, studying global in situ and remotely sensed data sets, and developing new technology. We welcome a MPOWIR intern to work with us on any mutually-agreeable aspect of this initiative. This could include, but is not limited to, model-data comparisons, dynamical studies of specific aspects of the MOC system, and/or developing innovative techniques for combining different types of in situ and remote measurement systems to address problems related to SAMOC. For more information about the SAMOC initiative, please visit: [http://www.aoml.noaa.gov/phod/SAMOC\\_international/](http://www.aoml.noaa.gov/phod/SAMOC_international/). The applicant should contact Drs. Renellys Perez and Shenfu Dong for further details.

## **2014 NOAA-MPOWIR Internship Opportunities**

### **NOAA GFDL: Global warming hiatus – Princeton, NJ**

#### **Primary supervisor: Tom Delworth**

The last decade has seen a slowdown, or “hiatus”, in the rate of global warming. While many theories exist for this, including changes in radiative forcing, recent work has suggested that an important factor is a sustained anomalous easterly wind stress in the tropical Pacific, leading to a strong oceanic response. This response includes a decadal-scale change in the tropical Pacific thermocline, with a deeper thermocline and warming in the western Pacific, and a shallower thermocline and near-surface cooling in the eastern Pacific. The anomalous winds subduct warm water into the ocean interior, thereby sequestering heat in the ocean. This heat sequester, combined with upwelling and exposure of colder interior waters at the surface, contributes to the hiatus. The proposed summer project will complement ongoing work examining the mechanisms and impacts of the hiatus. A large suite of model experiments have already been conducted that successfully reproduce this hiatus. The project will involve analysis of these experiments to better understand the nature of the adjustment and feedback processes involved in the hiatus, with particular emphasis on the fate of the extra subducted heat and comparisons to observed changes. Additional modeling experiments may be conducted that seek to better clarify these adjustments and feedbacks through the use of enhanced diagnostics, such as passive dyes in various experiments.

### **NOAA GFDL: Ocean circulation, ecosystems and biogeochemical cycles – Princeton, NJ**

#### **Primary supervisor: John Dunne**

My research focuses on physical and biogeochemical controls on ocean ecosystems and their response to environmental change including climate variability, anthropogenic climate change and ocean acidification. Areas where I am currently interested in hosting a student include: 1) Development of a composite geochemical tracer proxy of ocean ventilation age using radiocarbon, chlorofluorocarbon, helium and others to estimate ocean interior timescales and compare with model ages towards model fidelity assessment, 2) analysis of coupled physical-biological interactions in either GFDL's coupled carbon-climate Earth System Models used in the Fifth Coupled Model Intercomparison Project (CMIP5) or our next generation prototype models for high resolution eddying ocean. Such analysis would involve comparing model simulations to observational data sets such as from satellites and ocean field programs.

### **NOAA GFDL: Tropical Pacific climate and variability – Princeton, NJ**

#### **Primary supervisor: Andrew Wittenberg**

My research focuses on seasonal-to-centennial variations in tropical climate, both natural and man-made. Of particular interest is the El Niño / Southern Oscillation (ENSO) phenomenon -- Earth's strongest intrinsic climate fluctuation -- which involves complex ocean-atmosphere interactions over huge swaths of the globe. I would encourage applications from students interested in (1) diagnosing and addressing tropical Pacific climate biases in GFDL's state-of-the-art global climate models, particularly for the heat & momentum budgets of the surface mixed layer of the ocean; (2) evaluating the tropical/ENSO performance of the data assimilation system used at GFDL to marry observations with models; (3) assessing the performance of climate models in simulating and forecasting ENSO; or (4) exploring ENSO's response to anthropogenic, paleoclimatic, or idealized forcings. I will teach strategies for accelerating scientific discovery and clearly communicating research results, with opportunities to present a lab-wide seminar and publish a paper describing the summer's work. Candidates with backgrounds in physics, mathematics, computer science, and/or atmospheric and oceanic sciences are encouraged to apply.

### **NOAA-GFDL: Atlantic Meridional Overturning Circulation – Princeton, NJ**

#### **Primary supervisor: Rong Zhang**

My current research interests focus on the role of ocean circulation in climate. For example, changes in the Atlantic Meridional Overturning Circulation (AMOC) have a profound impact on global and regional climate. My area of research includes the understanding of AMOC variability using fully coupled climate models. Some examples include identifying AMOC fingerprints that can be used to reconstruct past AMOC variations when no direct observations were available and detect future AMOC variations, and investigating the meridional connectivity of AMOC variations with potential implications for designing the monitor systems for variations. I also study the impact of AMOC variations on global and regional climate, such as Sahel and Indian summer monsoon rainfall, Atlantic hurricane activities, and Arctic climate.