Large Scale Climate Dynamics
(Rainfall and Drought)

All tied together:
Atlantic Warm Pool
AMO
Rainfall
Hurricanes

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Rationale for Warm Pool Research

Why Study the Warm Pool?

- ENSO impacts climate mainly in winter; we need a value-added paradigm for summer climate prediction, especially for rainfall in the eastern US, and for Atlantic hurricanes.

- The Indo-Pacific and Atlantic compete with each other and the atmosphere responds to inter-basin anomalies. We can no longer afford to make projections based only on the Pacific.

- Warm pool size is an expression of SST anomalies, but weighted toward regions of maximum SST > 28°C where deep convective heating occurs -- also a good match for tropical cyclogenesis.

- Applicability to summer precip and hurricanes aligns the WP research extremely well with NOAA goals & stakeholder needs.
Correlation of AMO with U.S. divisional rainfall (1895-1999)
Enfield et al. (2001)

AMO & WP ==> similar impacts
Rainfall regressions very similar

Regression onto PDSI

(a) Atlantic Warm Pool (AWP)

<table>
<thead>
<tr>
<th>Large AWP</th>
<th>AMO &lt; 0</th>
<th>AMO &gt; 0</th>
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<td>8 (23%)</td>
<td>27 (77%)</td>
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<table>
<thead>
<tr>
<th>Small AWP</th>
<th>AMO &lt; 0</th>
<th>AMO &gt; 0</th>
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<tbody>
<tr>
<td>29 (83%)</td>
<td>6 (17%)</td>
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Gill atmosphere response to Warm Pool anomalies

Forced AGCM
Large minus Small AWP

Obs (NCEP reanalysis)
Large minus Small AWP

Geopotential Height & Wind (JJASON)

(a) 200 mb

(b) 850mb

Geopotential Height (NCEP Reanalysis)

(a) LAWP - SAWP (200hpa)

(c) LAWP - SAWP (850hpa)
IASCLIP = Intra Americas Study of Climate Processes
A CLIVAR-VAMOS Monsoons Program (FY09 - FY14)
Florida Water Management Districts

AOML research is influencing water planning
Statute-mandated 20-year water plans every 5 years

Lake Okeechobee inflow vs. AMO

[Graph showing AMO vs. mean N. Atlantic SSTA and Florida Div-4 Rainfall vs. L. Okeechobee Inflow]
A decision support tool for long-term planning

Let $t_1 = \text{years since last shift}; \quad t_2 = \text{years until the next shift}$

We now compute the conditional probability for $t_2$ given $t_1$
## Climate Indices: Monthly Atmospheric and Ocean Time Series

### AMO, smoothed

Note: this index is newly computed from a new dataset. Please use it and note that it supersedes the old indices. The data is calculated from the Kalplan SST. See the AMO webpage for more details.


### Tropical Northern Atlantic Index

Anomaly of the average of the monthly SST from 5.5N to 23.5N and 15W to 57.5W. GISST and NOAA OI 1x1 datasets are used to create index. Climatology is 1951-2000.


### Western Hemisphere warm pool


### AMO, unsmoothed

Note: this index is newly computed from a new dataset. Please use it and note that it supersedes the old indices. The data is calculated from the Kalplan SST. See the AMO webpage for more details.


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www.cdc.noaa.gov/ClimateIndices/List/
Summary and Future Vision

- With its focus on the AWP, AOML climate research is unique; it’s relevant to society and it’s well aligned with NOAA’s strategic goals.

- Research methods are varied & robust, using both models and obs, it’s cross-disciplinary with hurricane research, and collaborative with RSMAS.

- The AOML research is helping to shape the research agenda for the next decade ==> on track to achieve improved predictions for summer climate.

- We are providing services to users and we are engaging with hydrologists who influence public water policy.

- Immediate future: CLIVAR-VAMOS is expected to begin the IASCLIP program and NOAA CPO will issue AO’s for IAS research in FY09; AOML will begin coupled model experiments and research on the interactions of global warming with natural variability.

- By 2015: Models should be improved and prediction methods will be transitioned to operations. This will follow the example set by the NAME program and predictions will be based on BOTH ocean basins.