

Weekly Climate Update September 16th, 2008

➤ Conditions in the Atlantic this year have been favorable for an active season because of warm sea surface temperatures and low wind shear (winds that tear a tropical cyclone apart). Although La Nina conditions in the equatorial Pacific Ocean have subsided, the atmospheric jet stream over North American and the North Atlantic are still retaining some characteristics of the faded La Nina, William Patzert indicated. "The upper atmospheric winds that could shear the tops off tropical storms are staying north, allowing tropical storms to develop and grow into hurricanes. Compared to the long-term historical record, the first half of the 2008 hurricane season has been busier than usual. According to meteorologist Scott Braun at NASA's Goddard Space Flight Center, Greenbelt, Md.: "Looking back to 1995 and earlier, most seasons have had only 5-7 storms by Sept. 2, whereas this year has had 10. 2008 is surpassed only by 1995 (13), 2003 (11), and 2005 (14) and matched by 2004 (10). Prior to 1995, the last time there were 10 storms by Sept. 2 was 1936 (11)."

➤ Most of the Atlantic Basin is currently under the influence of downward motion of the Madden Julian Oscillation , with the exception of upward motion near and over Africa. The current MJO will likely suppress tropical cyclone development across the tropical Atlantic early during the period. Continued MJO propagation, however, is expected to increase the chances for development across the western Gulf of Mexico and Caribbean Sea during Week 2 [see slide 18].

➤ Recommended link

<http://www.wunderground.com/blog/JeffMasters/comment.html?entrynum=1087&tstamp=200809>

(Continue from previous Slide)

➤The North Atlantic Oscillation (NAO) index has been trending downward and is currently negative. A persistent negative NAO index is associated with a greater chance of hurricane landfalls along the Gulf Coast of the U.S. and Florida [Elsner and Bossak, 2004]. The NAO has specific effects upon the Bermuda high pressure system in the Atlantic Ocean. A negative NAO allows for a weaker more westward centered Bermuda High, which acts to steer North Atlantic hurricanes toward the southern United States rather than re-curving toward the open North Atlantic[Slide25].

<http://garnet.acns.fsu.edu/~jelsner/PDF/Research/ElsnerLiuKocher2000.pdf>

➤Summary of current global ocean-climate conditions can be found at the following link: http://ioc3.unesco.org/oopc/state_of_the_ocean/all/

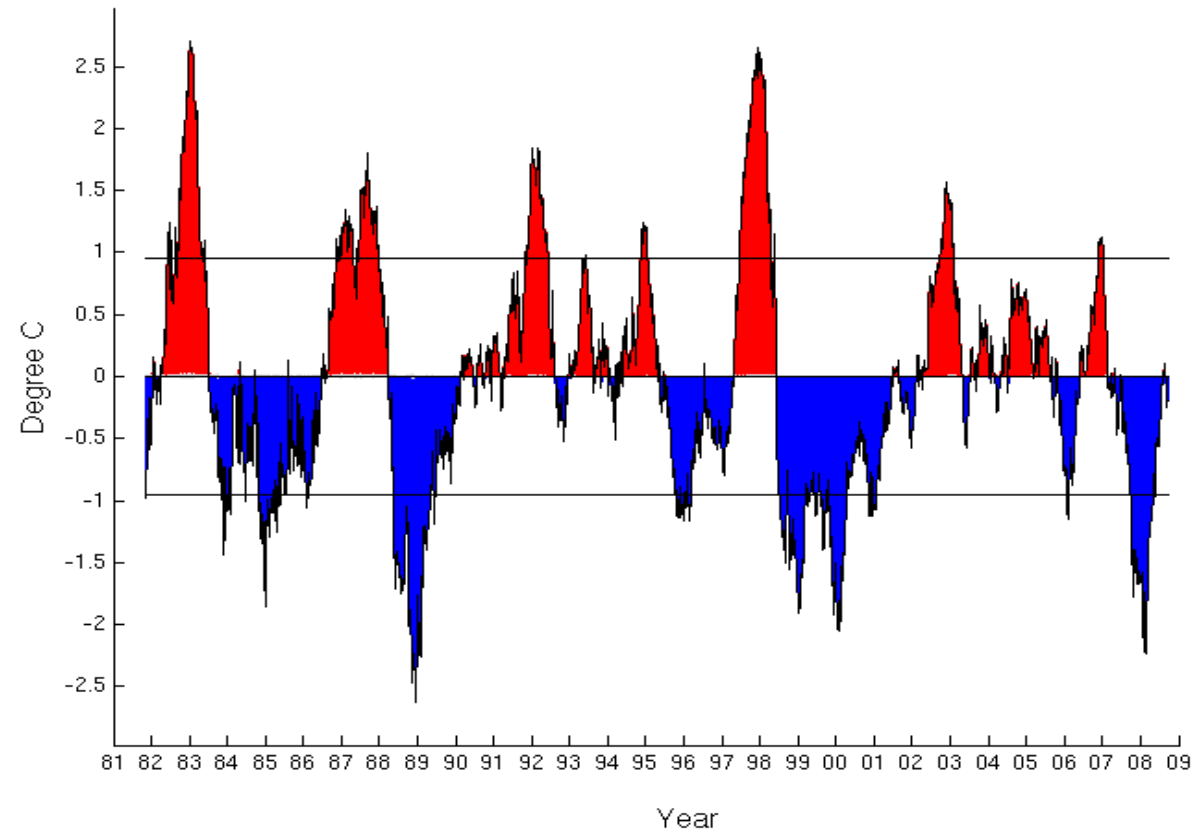
➤The CPC official climate outlook indicates an increased chance for above normal rainfall for the September through November climate window.

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El Nino-Southern Oscillation Index

NINO 3.4



2007-2008 La Nina compared with other ENSO events since 1981.

ENSO is currently in neutral conditions.

http://ioc3.unesco.org/oopc/state_of_the_ocean/sur/pac/nino3.4.php

Recent Evolution of Equatorial Pacific SST Departures (° C)

Climate Prediction Center

El Nino-Southern Oscillation Weekly Update

October
2007

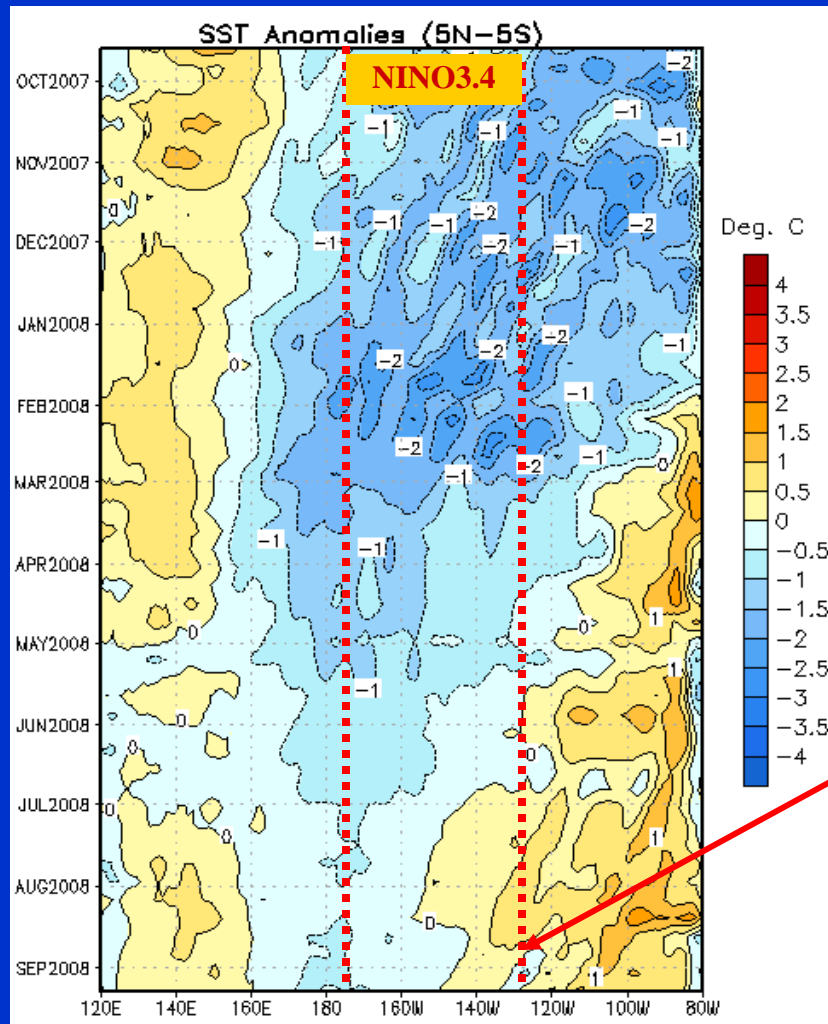
January
2008

Time

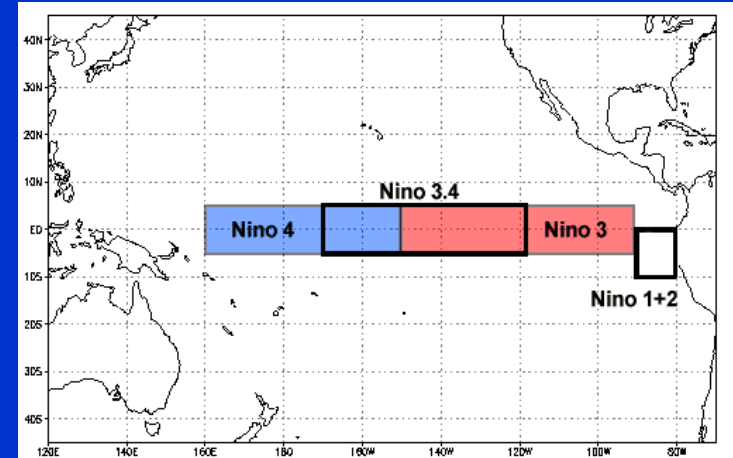


June.
2008

Sept.
2008



Longitude



Since February 2008, negative sea surface temperature anomalies have weakened over the central and east-central equatorial Pacific Ocean.

Recently, positive anomalies have weakened over the eastern Pacific.

Niño Region SST Departures (° C) Recent Evolution

Climate Prediction Center

El Nino-Southern Oscillation Weekly Update

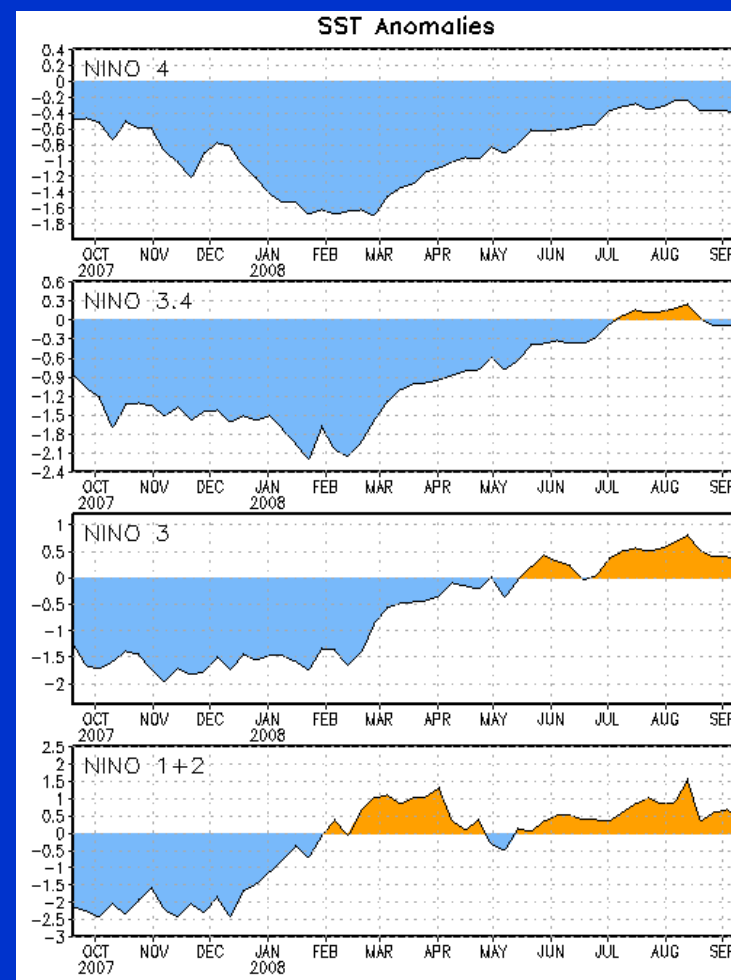
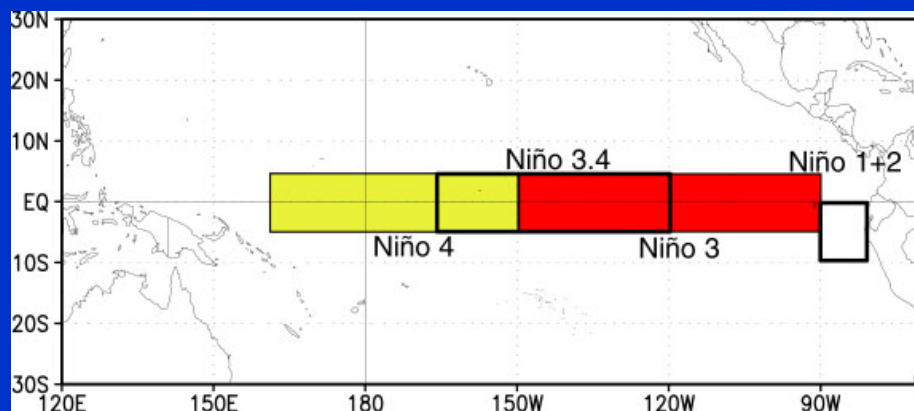
The latest weekly SST departures are:

Niño 4 -0.4°C

Niño 3.4 -0.1°C

Niño 3 0.4°C

Niño 1+2 0.5°C



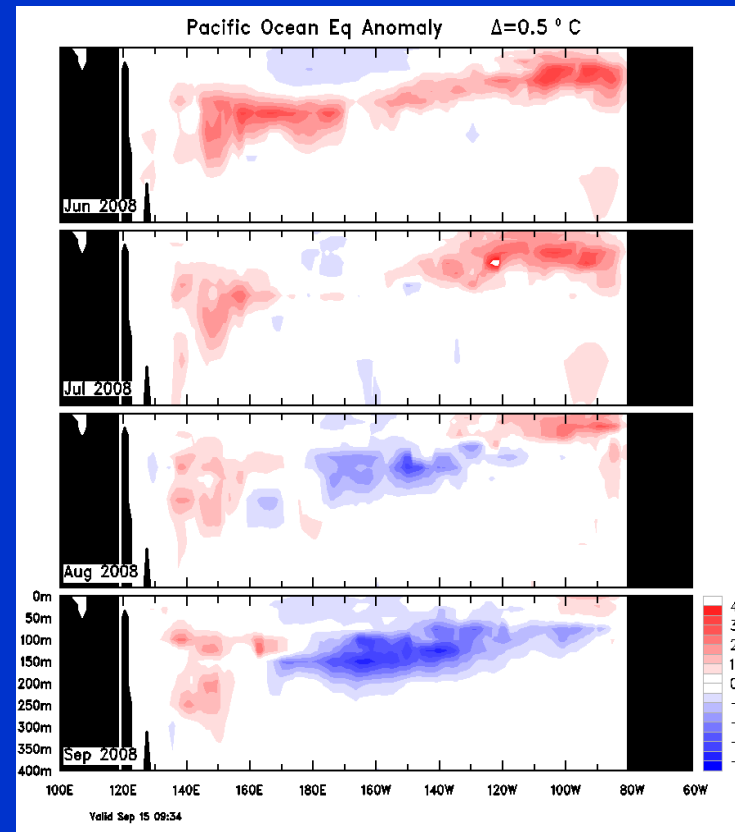
Sub-Surface Temperature Departures ($^{\circ}\text{C}$) in the Equatorial Pacific Ocean (September 15th, 2008) Bureau of Meteorology Research Centre

Jun

Jul

Aug

Sep



Longitude

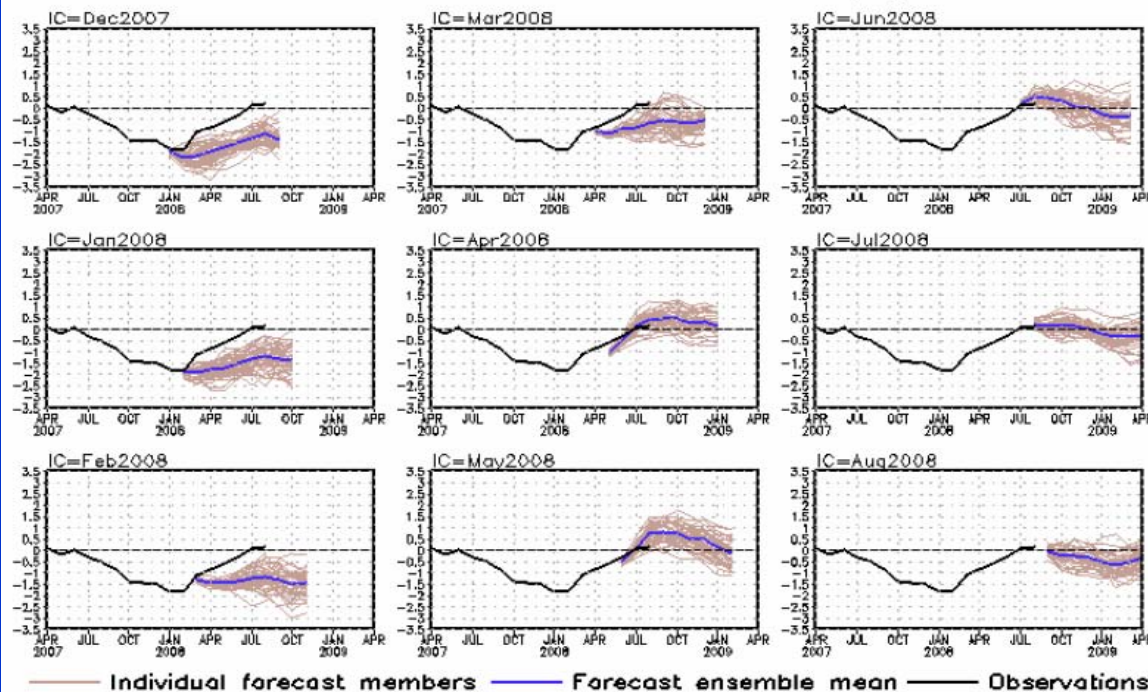
At this time neutral conditions are indicated by sea surface temperature (sst). However, La Nina conditions have continues to persists in the atmosphere. Recently cool subsurface anomalies has appeared in the equatorial Pacific. These anomalies have begun to expand towards the surface in the eastern and central Pacific.

The CFS ENSO ensemble forecast has had a significant upward shift during recent weeks.

Verification of Nino 3.4

CFS Niño3.4 SST Predictions from Different Initial Months

NINO3.4 SST anomalies (K)



- Latest forecasts are calling for ENSO-neutral to weak La Nina conditions.

Fig. M1. CFS Niño3.4 SST prediction from the latest 9 initial months. Displayed are 40 forecast members (brown) made four times per day initialized from the last 10 days of the initial month (labeled as IC=MonthYear) as well as ensemble mean (blue) and observations (black). The hindcast climatology for 1981-2006 was removed, and replaced by corresponding observation climatology for the same period. Anomalies were computed with respect to the 1971-2000 base period means.

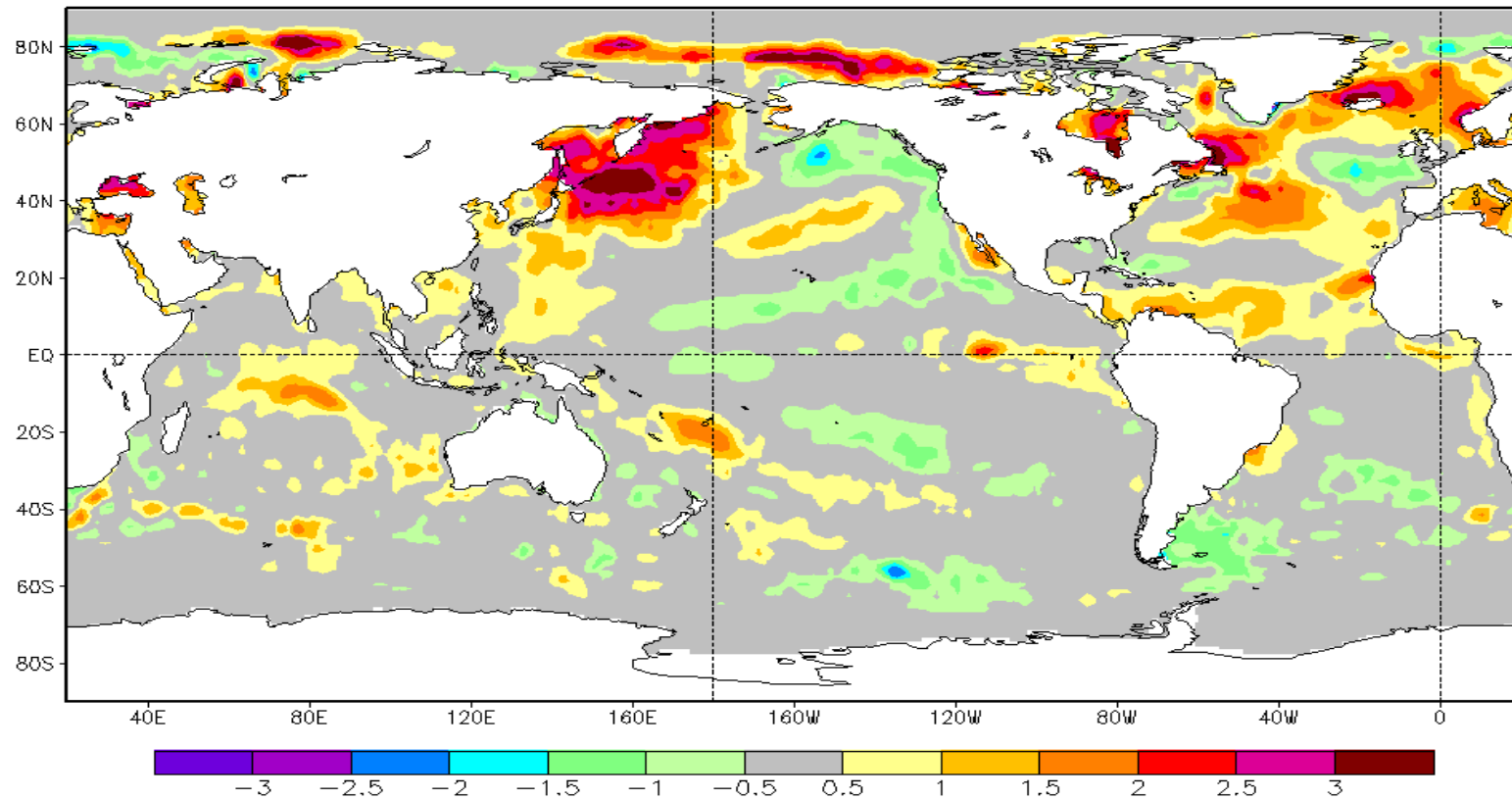
31

El Nino never formed in the wet season. If it had this would have cut down on the number and strength the 2008 hurricane season.

Latest Weekly Sea Surface Temperature Anomaly

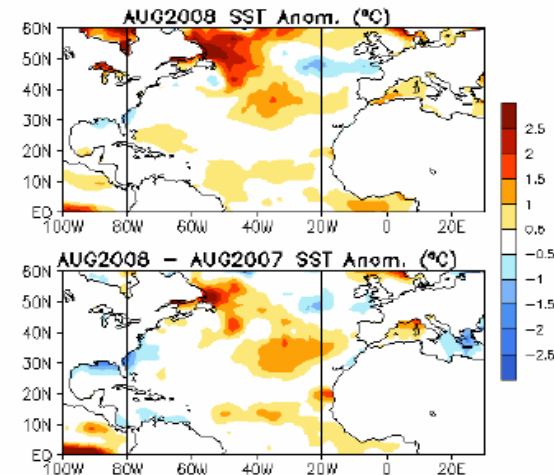
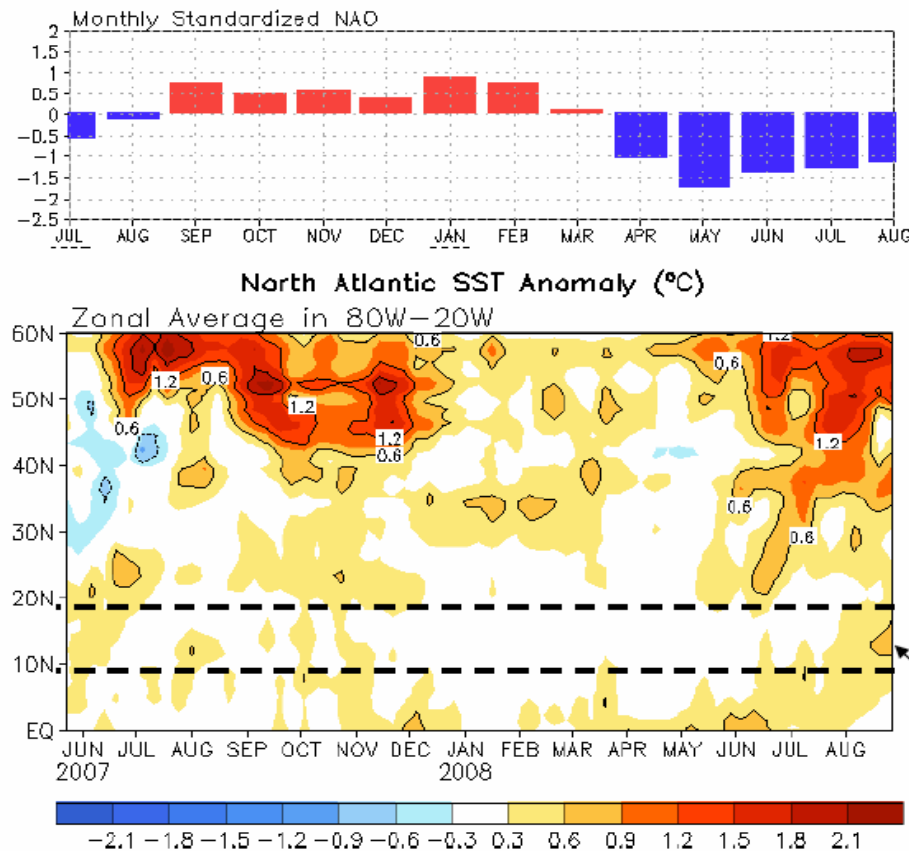
National Climate Data Center

Sea Surface Temperature Anomaly ($^{\circ}\text{C}$), Base Period 1971–2000
Week of 10 SEP 2008



➤The Main Development Region for tropical development is still much warmer than normal for the time of year.

NAO and SST Anomaly in North Atlantic



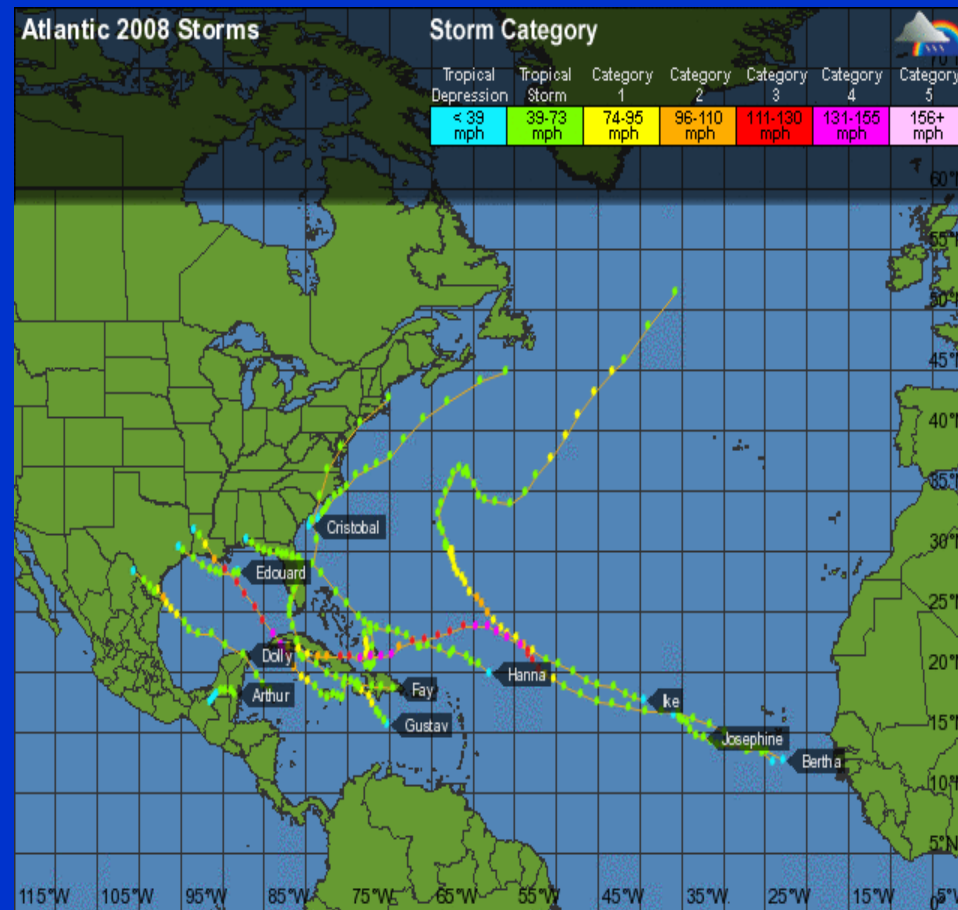
- High-latitude North Atlantic SSTA are closely related to NAO index – negative (positive) NAO leads to SST warming (cooling).
- Negative NAO index persisted over last 5 months has caused large warming in high-latitude North Atlantic, and possibly also the recent warming in hurricane main development region.

fig. NA2. Monthly standardized NAO index (top) derived from monthly standardized 500-mb height anomalies obtained from the NCEP CDAS in 20°N-90°N (<http://www.cpc.ncep.noaa.gov>). Time-Latitude section of SST anomalies averaged between 80°W and 20°W (bottom). SST are derived from the NCEP OI SST analysis, and anomalies are departures from the 1971-2000 base period means.

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Negative NAO index caused warming in high latitudes north Atlantic and possibly this wet season warming MDR

Path and Strength of 2008 Tropical Storms and Hurricanes



Negative NAO anomalies tend to direct tropical storms and hurricanes further west with landfall often occurring before recurvature

Evolution of Tropical Atlantic SST Indices

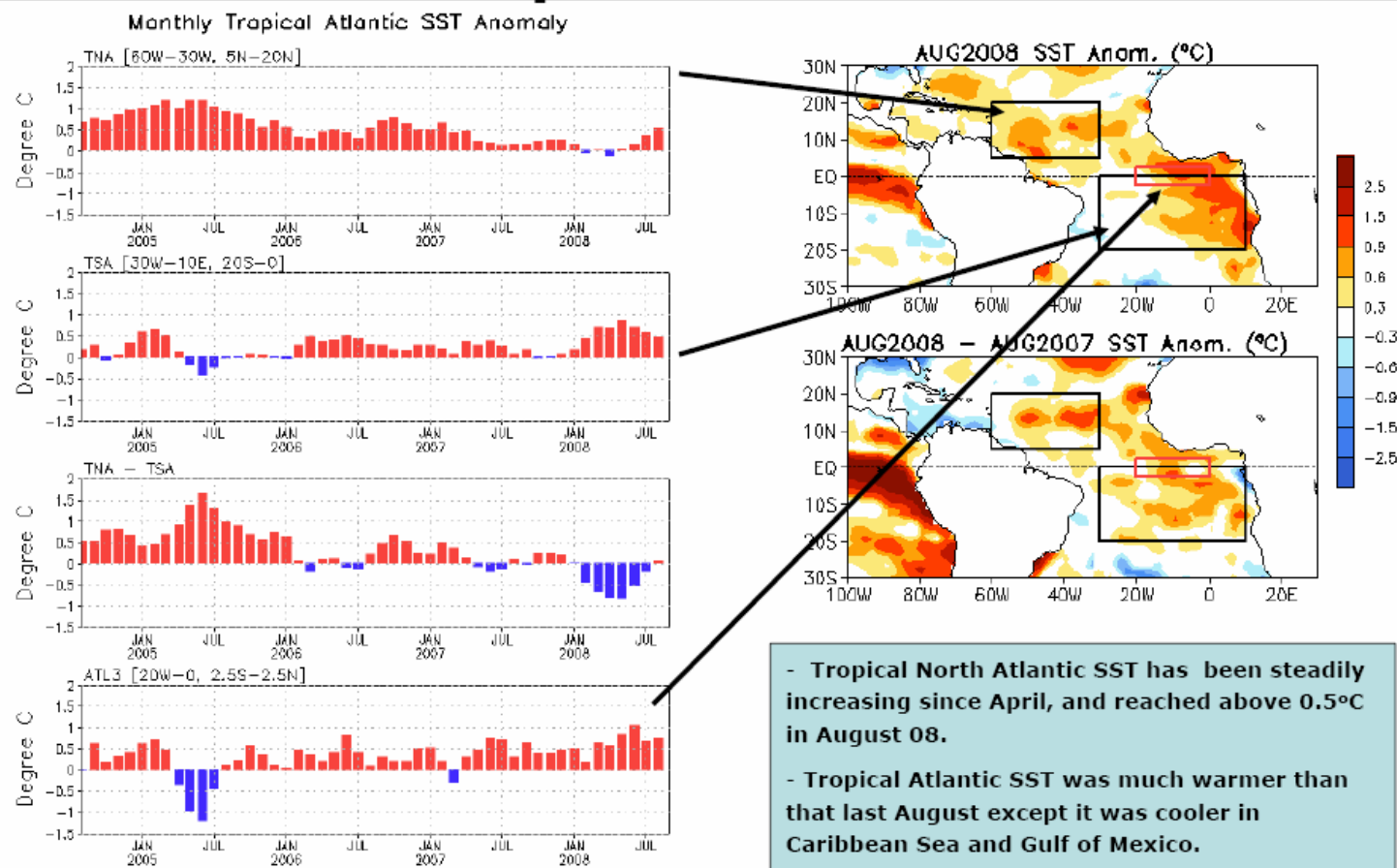
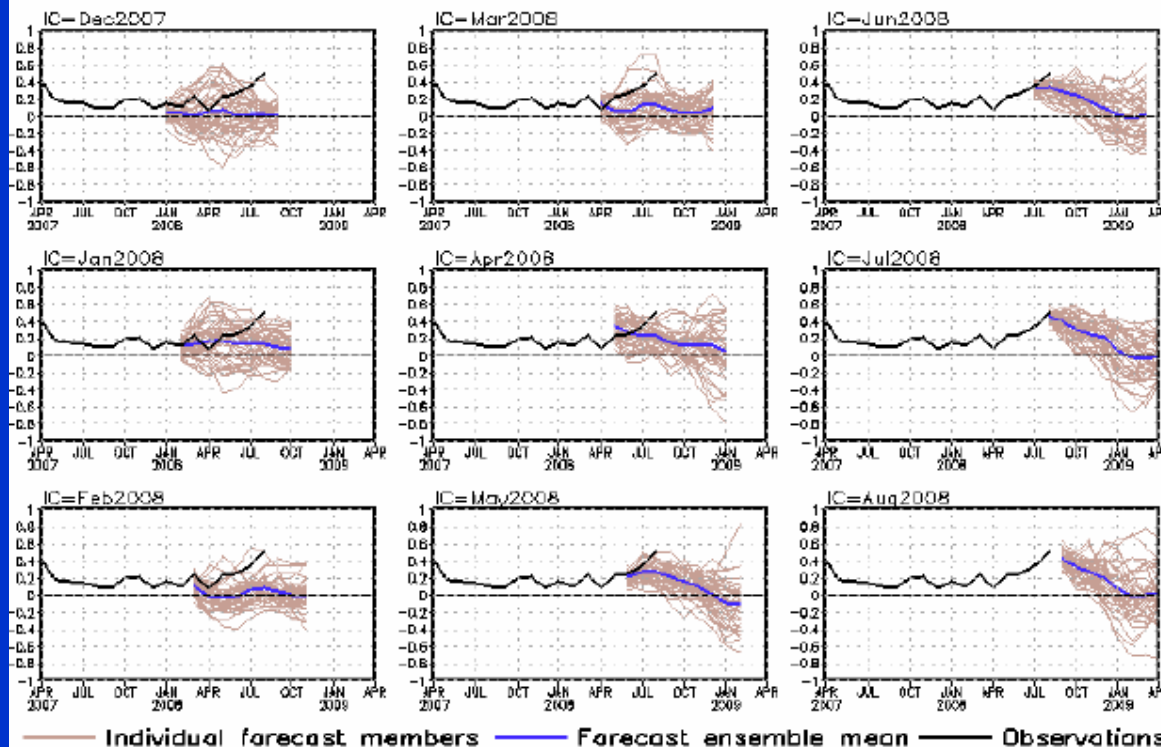


Fig. A1a. Tropical Atlantic Variability region indices, calculated as the area-averaged monthly mean sea surface temperature anomalies (°C) for the TNA [60°W-30°W, 5°N-20°N], TSA [30°W-10°E, 20°S-0] and ATL3 [20°W-0, 2.5°S-2.5°N] regions, and Meridional Gradient Index, defined as differences between TNA and TSA. Data are derived from the NCEP OI SST analysis, and anomalies are departures from the 1971-2000 base period means.

Verification of the Tropical Atlantic

CFS Tropical North Atlantic (TNA) SST Predictions from Different Initial Months

Tropical N. Atlantic SST anomalies (K)



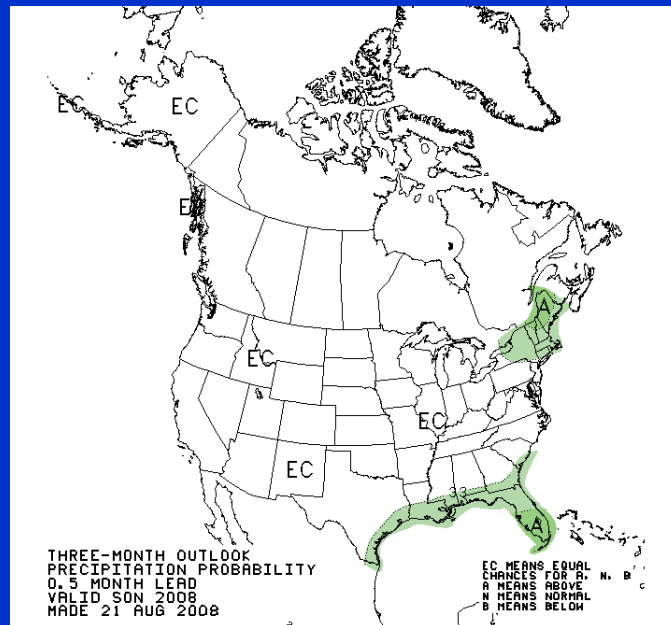
TNA is the SST anomaly averaged in the region of [60°W-30°W, 5°N-20°N].

- CFS always damps SSTA in I.C., suggesting either the SSTA is unpredictable or the model has systematic errors in predicting SSTA in hurricane main development region.

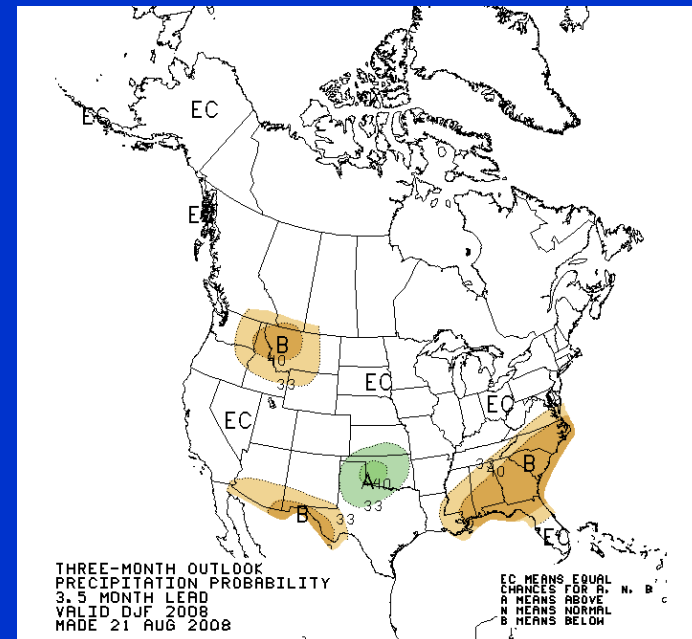
Fig. M3. CFS Tropical North Atlantic (TNA) SST predictions from the latest 9 initial months. Displayed are 40 forecast members (brown) made four times per day initialized from the last 10 days of the initial month (labeled as IC=MonthYear) as well as ensemble mean (blue) and observations (black). The hindcast climatology for 1981-2006 was removed, and replaced by corresponding observation climatology for the same period. Anomalies were computed with respect to the 1971-2000 base period means.

CPC Seasonal Rainfall Outlook

September- November

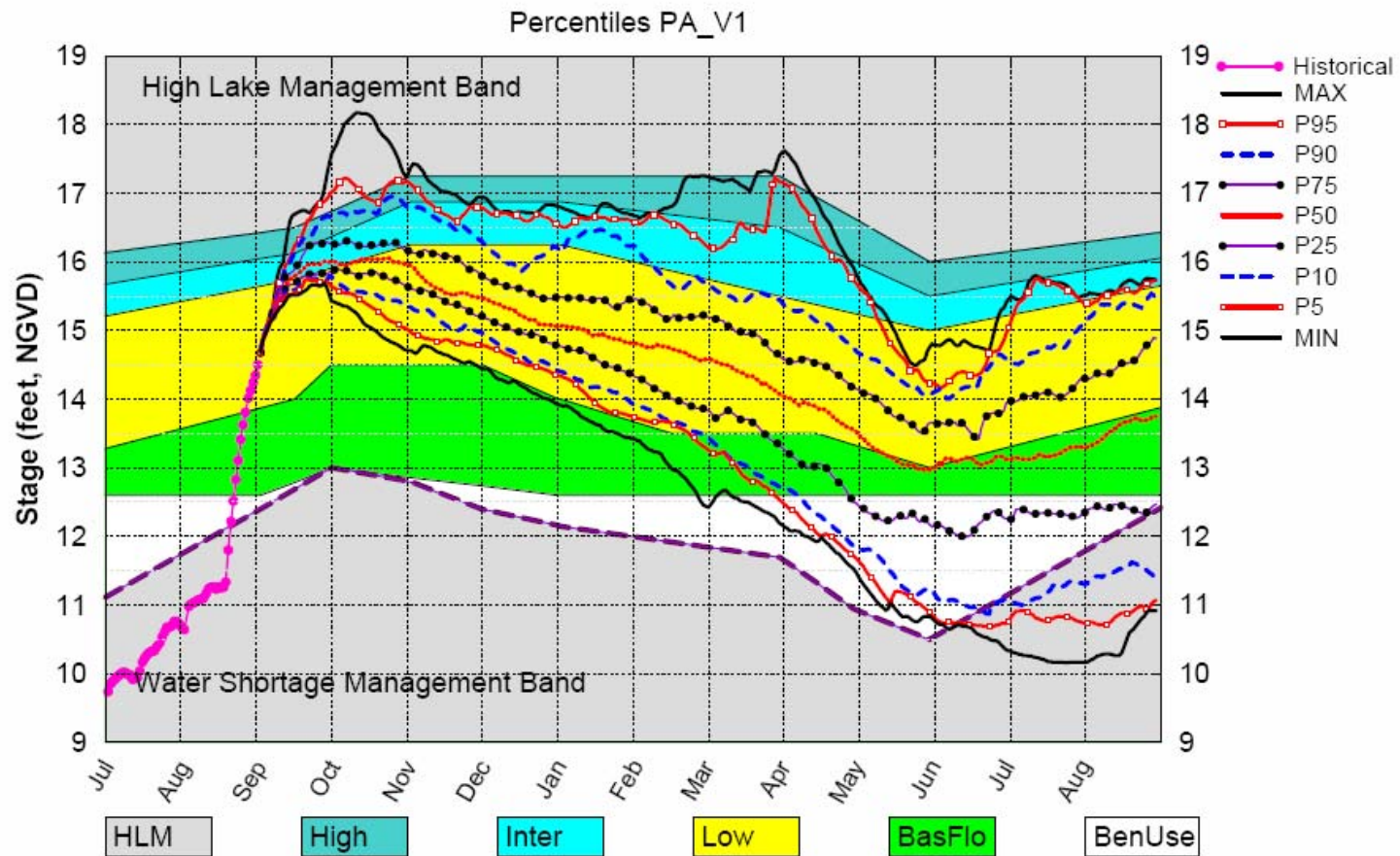


December-February



September 1st Position Analysis

Lake Okeechobee SFWMM September 2008 Position Analysis

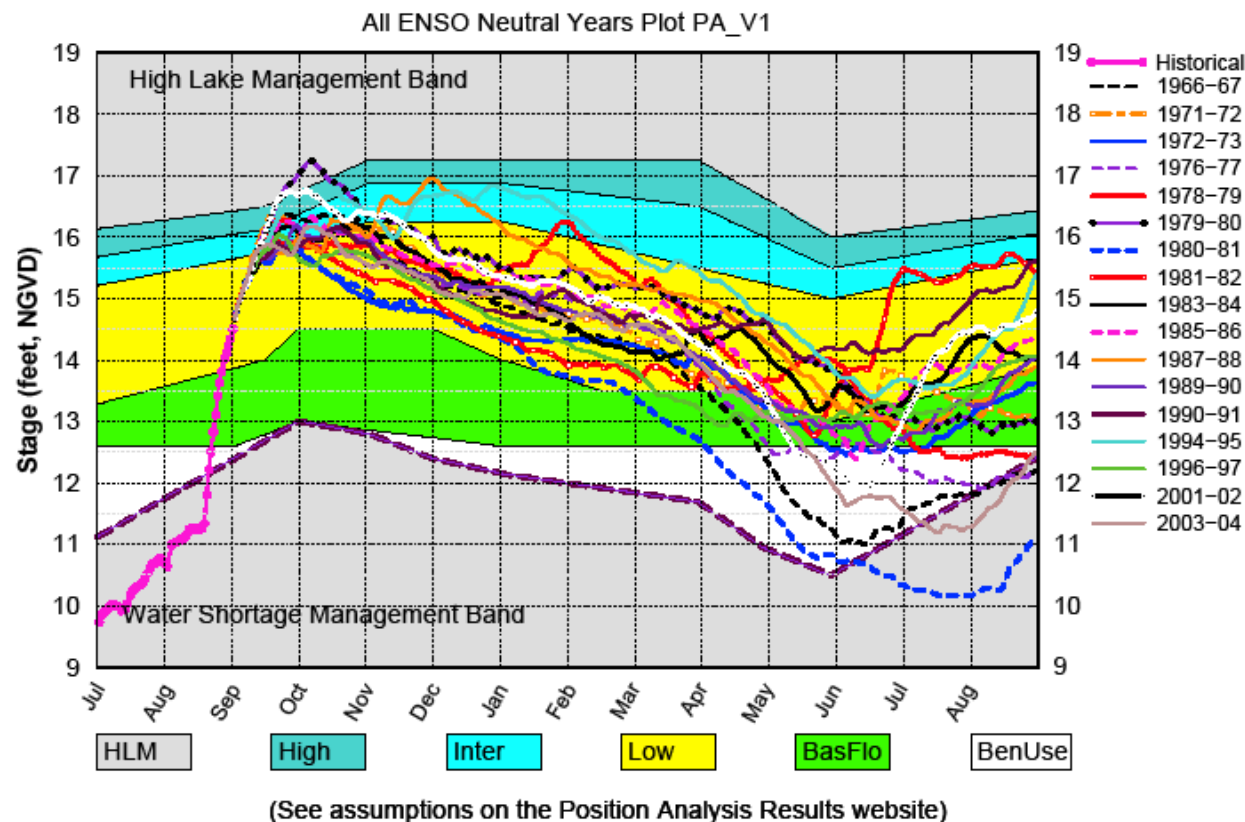


(See assumptions on the Position Analysis Results website)

Fri Sep 5 15:40:25 2008

September 1st ENSO neutral years Position Analysis

Lake Okeechobee SFWMM September 2008 Position Analysis



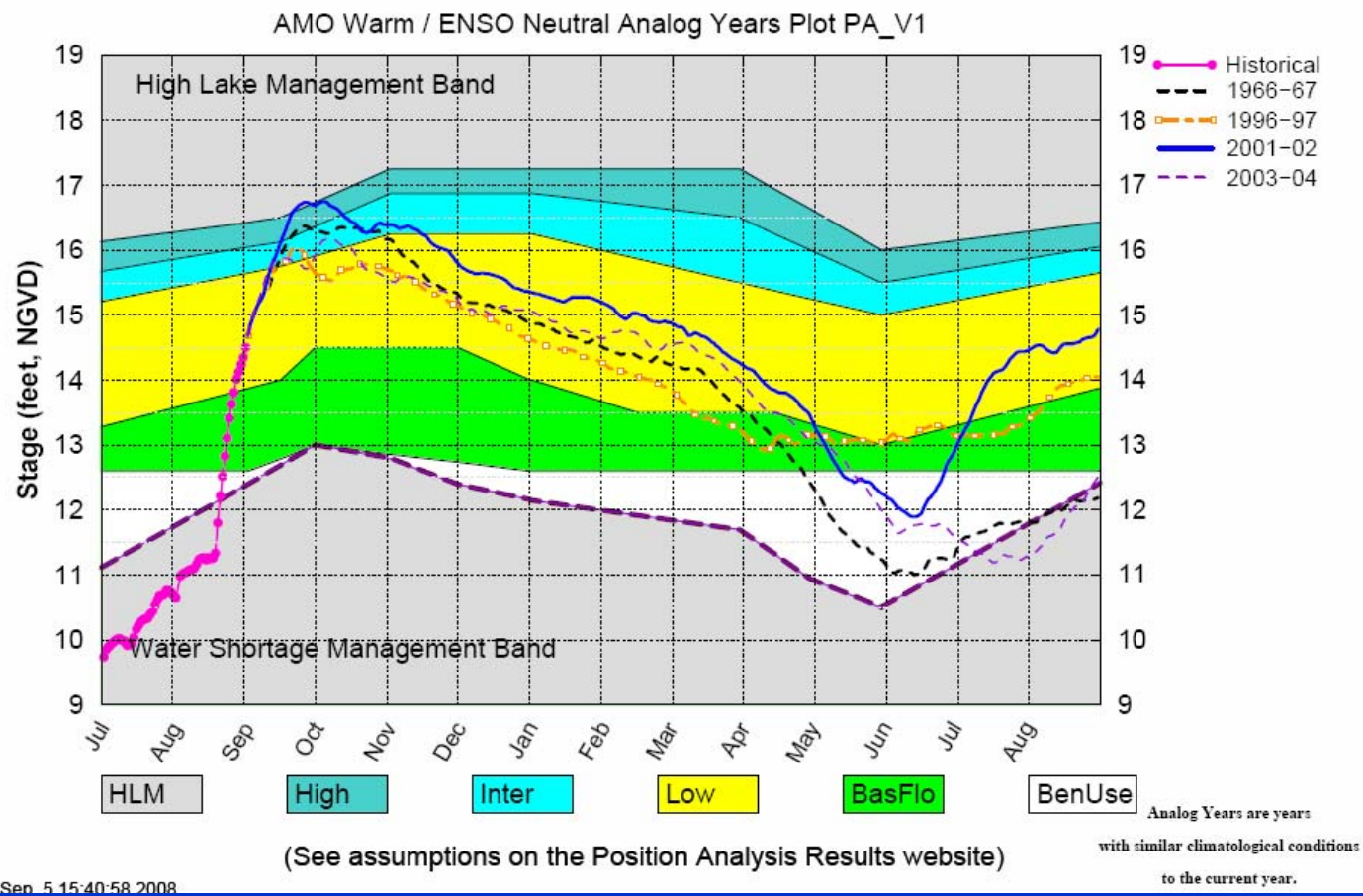
Fri Sep 5 15:40:57 2008

Although ENSO is officially in neutral conditions according to CPC, many of the atmospheric properties of La Nina are still lingering. Therefore caution should be used when considering this plot. However, it is clearly not an El Nino warm event,

September 1st Position Analysis

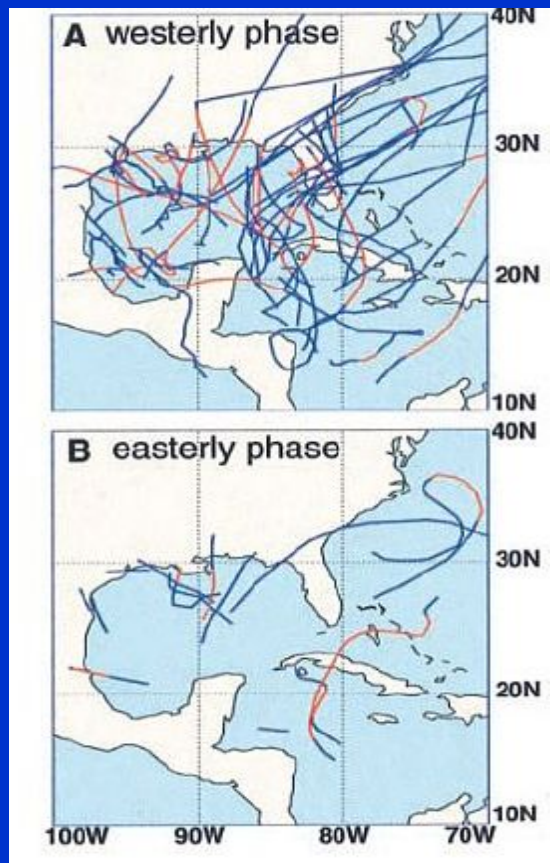
ENSO Neutral/AMO Warm sub sampling

Lake Okeechobee SFWMM September 2008 Position Analysis

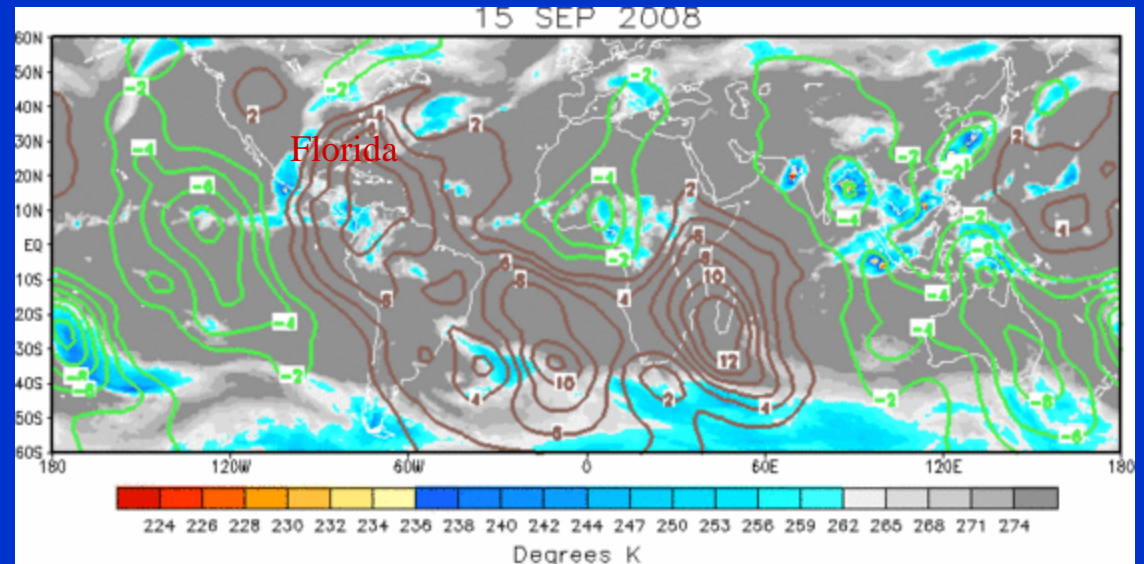


Madden Julian Oscillation (MJO)

Historical (1947-1977)



Current state of MJO



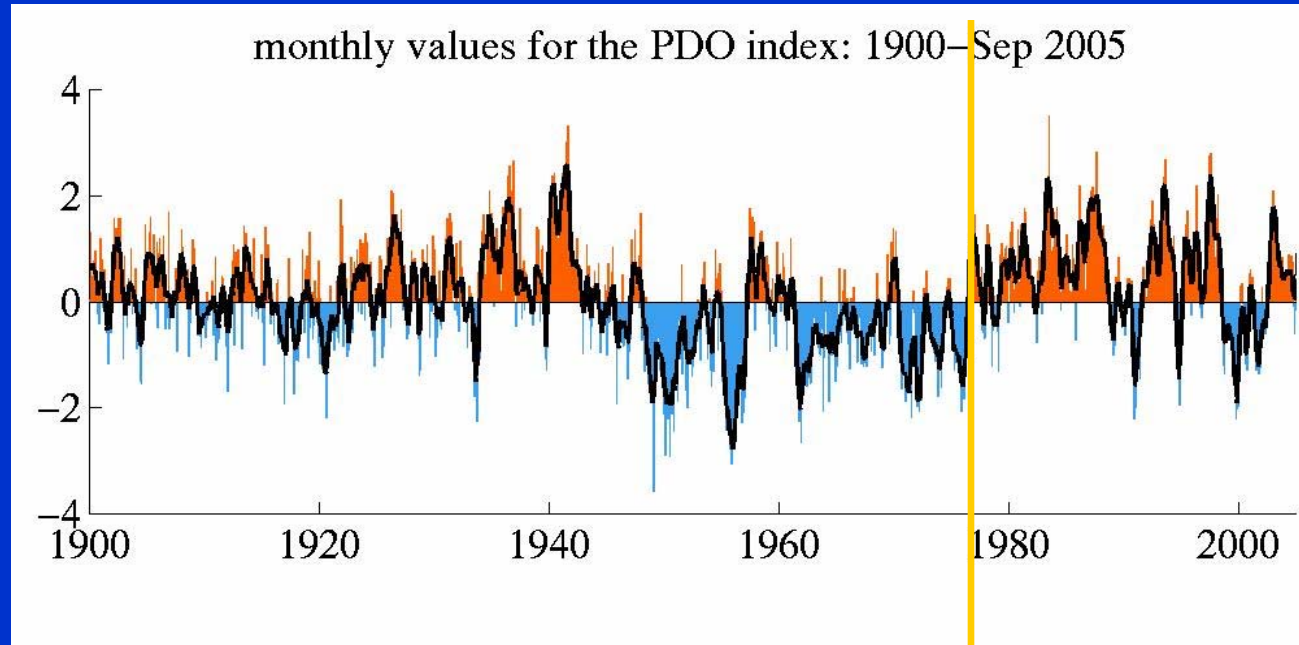
Brown (Green) contours indicate region of easterly (westerly) phase

The contrast between the westerly phase and the easterly phase of the eastward propagating of the MJO is striking. During westerly MJO periods between 1949-77, 50 tropical storms developed compared with 14 during easterly periods. The numbers were similarly disparate for hurricane formation, 24 to 6.

Backup Slides with additional support material

Currently
transitioning
to cold phase of
PDO

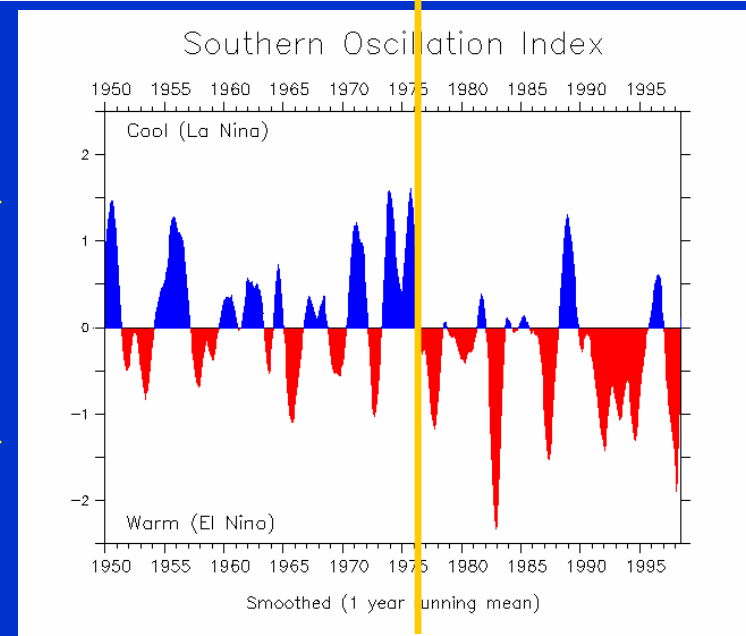
PDO



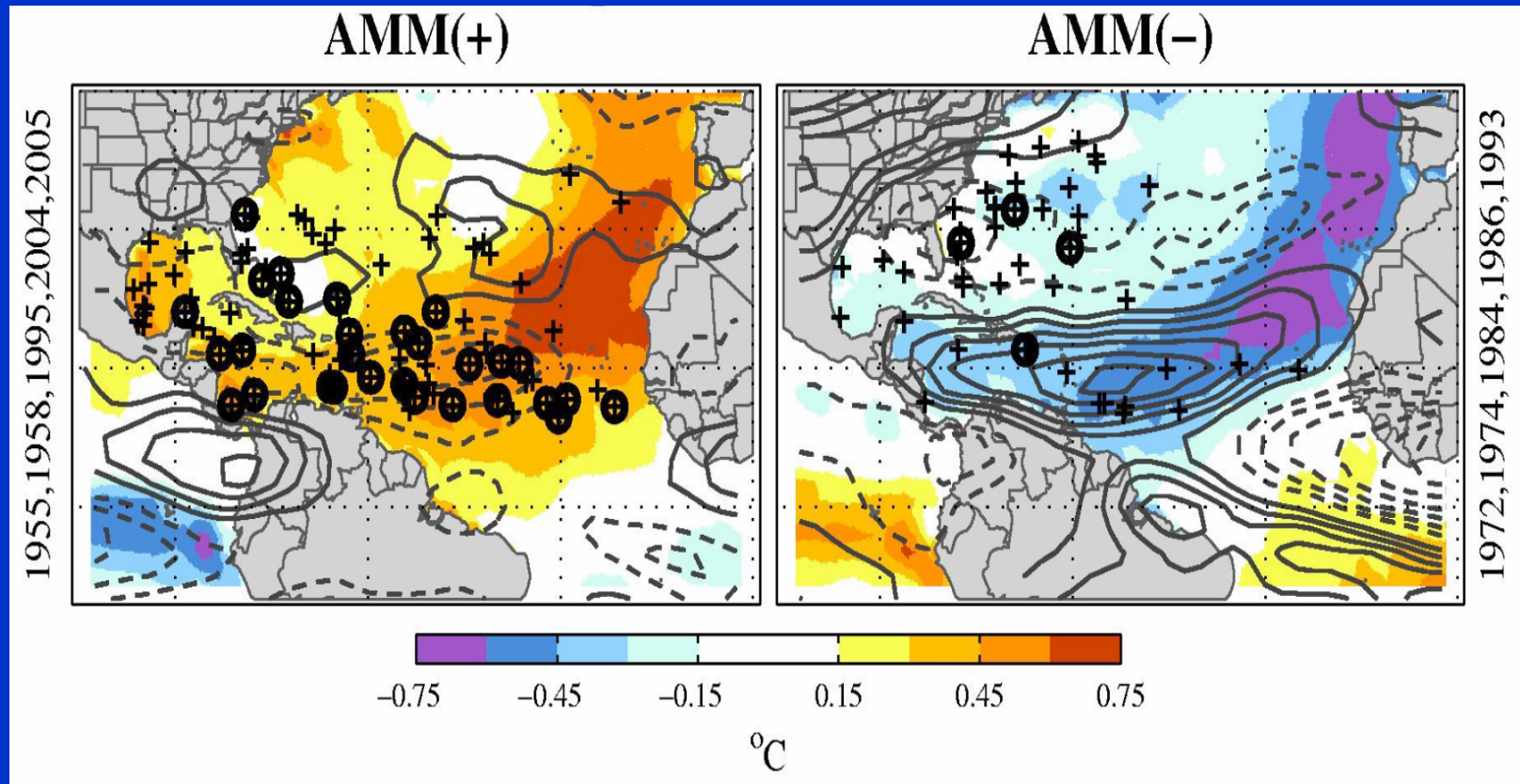
ENSO

La Nina predominates when
PDO is in negative phase →

El Nino predominates when
PDO is in positive phase →



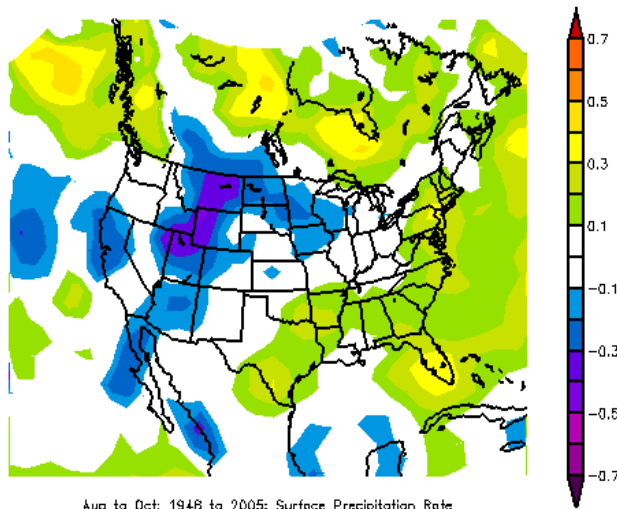
Composites associated strongest AMM (+) and AMM (-)



Tropical cyclo-genesis points for the five strongest and five weakest AMM years, superimposed on composites of SST (shaded) and shear (contours) anomalies. Crosses show the genesis points for all storms that reached tropical storm strength. Storms that reached “major hurricane” strength (maximum sustained surface wind speed $> 49 \text{ m s}^{-1}$) also have a circle around their genesis point. Solid (dashed) shear contours denote positive (negative) values. The contour interval is 0.25 m s^{-1} and the zero-contour has been omitted. Shear was calculated every 6 h as the amplitude of the vector difference between the layer-mean winds in the 300–150 hPa and 925–700 hPa layers, and means were formed around the hurricane season from monthly means.

Correlation between RF and Atlantic Meridional Mode and Atlantic Multidecadal Oscillation

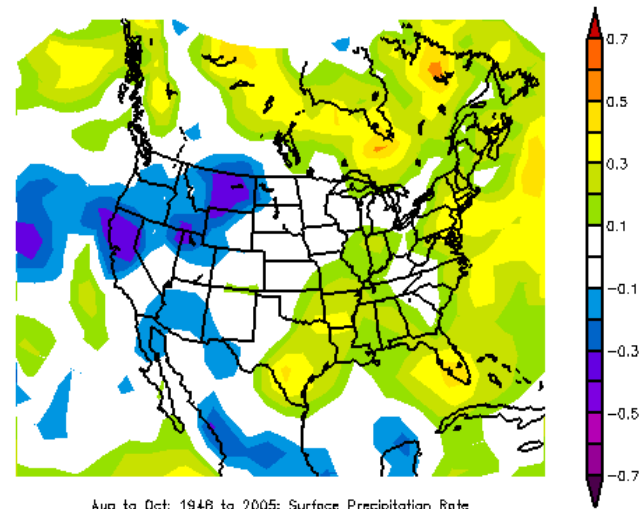
AMM



Aug to Oct: 1948 to 2005: Surface Precipitation Rate
Seasonal Correlation w/ Aug to Oct AMM
NCEP/NCAR Reanalysis

NOAA/ESRL Physical Sciences Division

AMO



Aug to Oct: 1948 to 2005: Surface Precipitation Rate
Seasonal Correlation w/ Aug to Oct AMO
NCEP/NCAR Reanalysis

NOAA/ESRL Physical Sciences Division

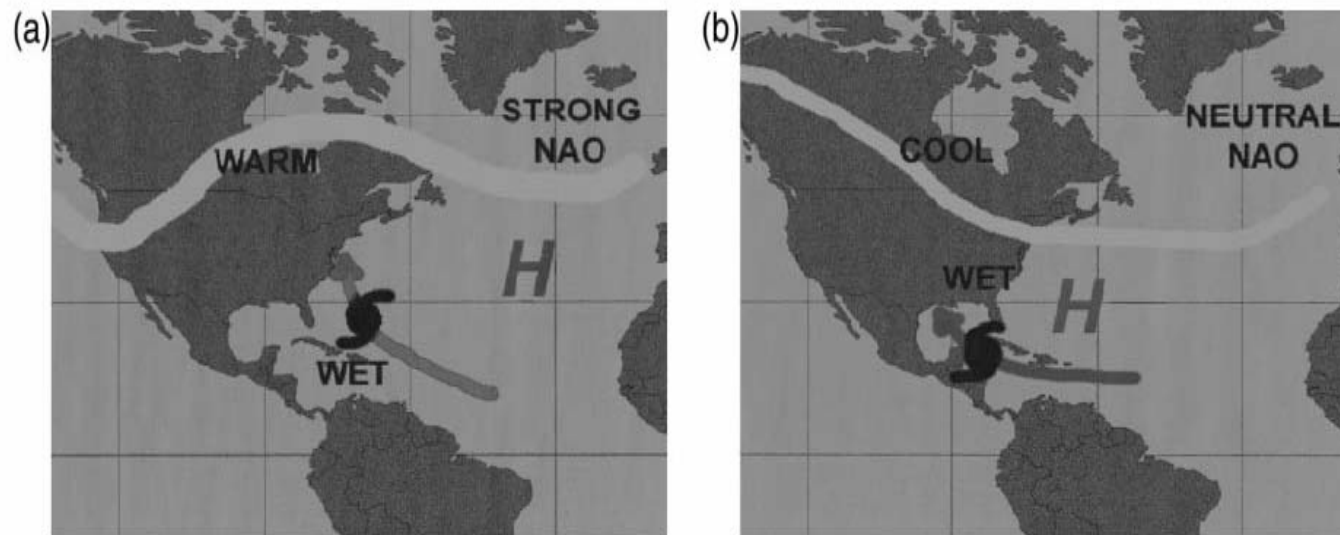


FIG. 3. A sketch of the inferred mean Jul midlatitude jet stream and subtropical high for conditions of (a) strong and (b) neutral NAO. A southwestward shift of the Bermuda high by 3000 yr BP likely brought less precipitation to the northeast Caribbean and more catastrophic hurricanes to the Gulf Coast. Adapted from Liu (1999).

Sea Surface Temperature Anomaly

Tropical Atlantic Main Development Region

