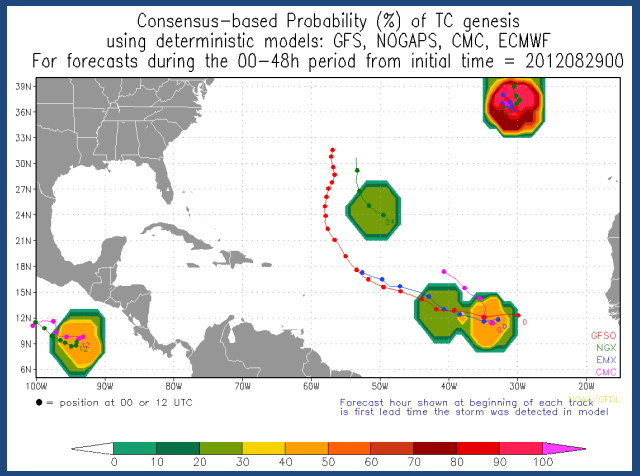
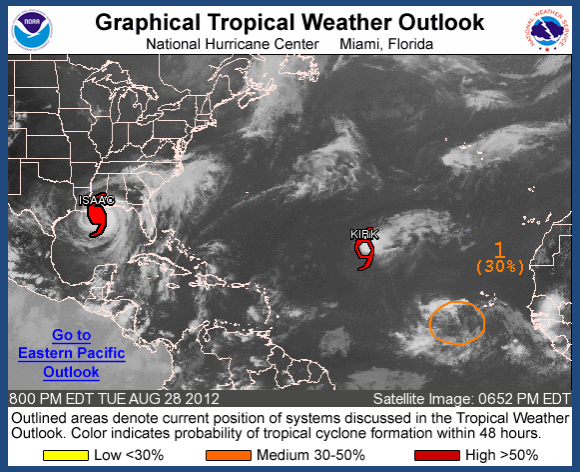
Ensemble-based genesis guidance

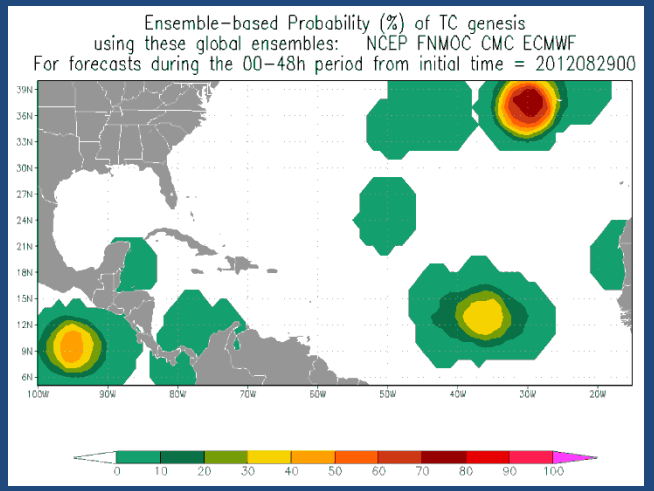
Tim Marchok

GFDL

HFIP 9/26/2012 Telecon







- **Goal**: Provide objective guidance on TC genesis based on dynamical forecast models.

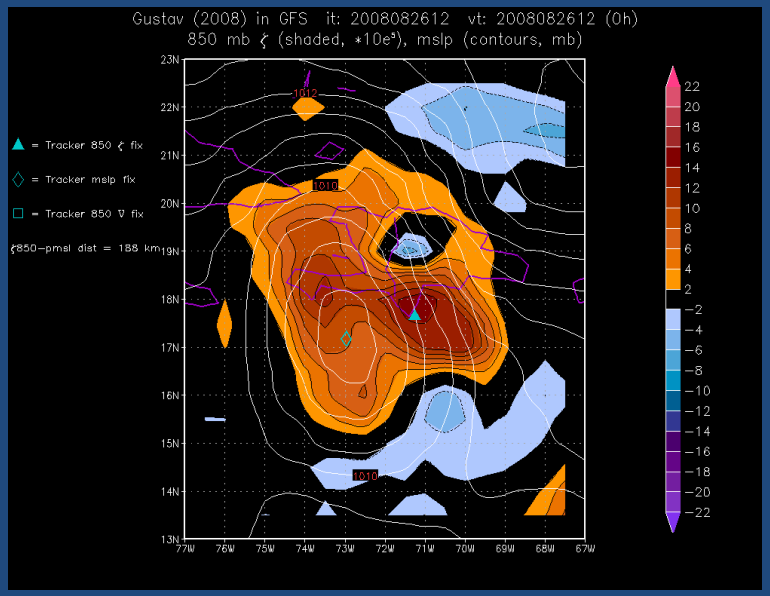
- **Methods**: Create probabilistic guidance based on a consensus of track forecasts from global deterministic models as well as their ensemble forecast systems.

Models included

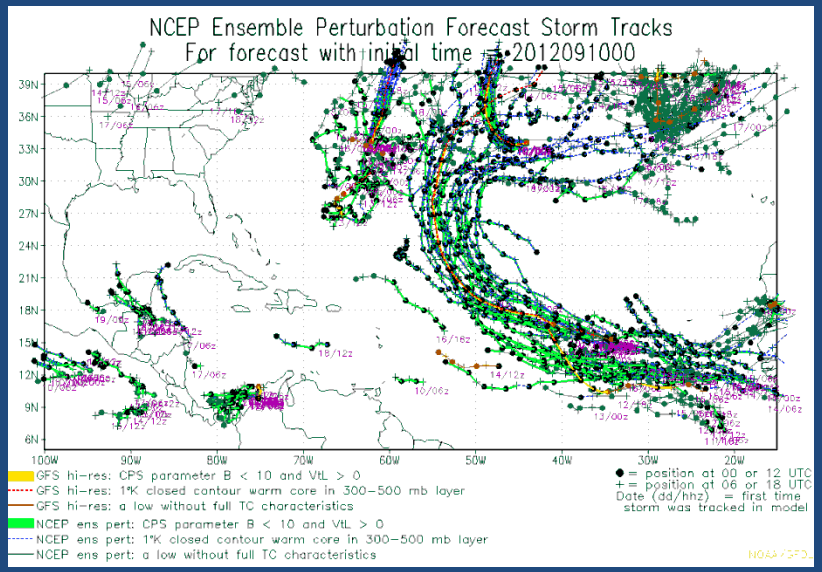
Ensemble System	# Members	Forecast cycle availability (UTC)
NCEP	20	00, 06, 12, 18
FNMOC	20	00, 12
CMC	20	00, 12
ECMWF	50	00, 12
Deterministic models		**Forecast cycle availability (UTC)**
NCEP / GFS		00, 06, 12, 18
FNMOC / NOGAPS		00, 12
CMC		00, 12
ECMWF		00, 12

Procedure

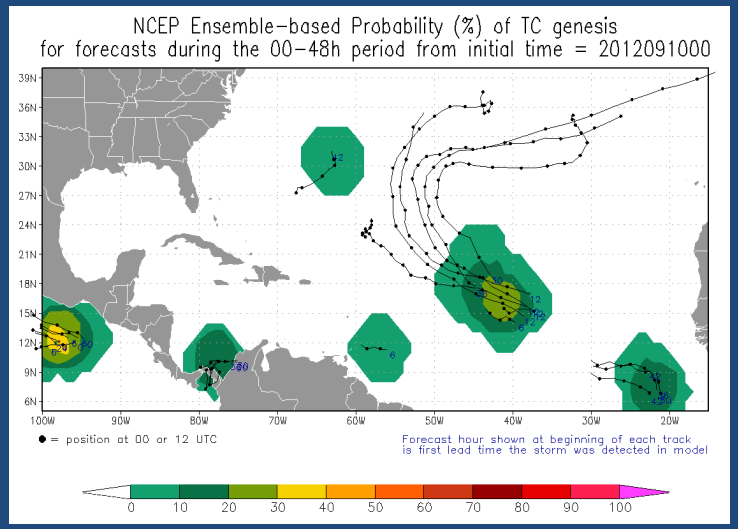
1. Run tracker for each ensemble member



2. Post-process tracker results to filter and categorize storms.



3. Compute genesis probabilities based on track results from all members



Detect & track new storms

1. Initial scan identifies candidate lows, based only on mslp.
2. Second scan is performed to refine the locaton of lows, using additional parameters:
   - zeta (700 mb, 850 mb, 10-m)
   - gp height (700 mb, 850 mb)
   - minimum in wind speed (700 mb, 850 mb, 10-m)
   - mslp
3. For both scans, checks are performed to ensure each found center resembles a cyclone.

Filter & categorize storms

1. Model forecast storms that do not live for at least 24h are filtered out.
2. Checks are performed at each lead time for a closed mslp contour (1 mb interval) as well as for strength of 850 mb circulation, but results do not need to be 100% continuous.
3. Storms are categorized using two of Hart's cyclone phase space parameters:
   - Parameter B (cyclone tilt / asymmetry): < 10 for TC
   - Lower-level (600-900 mb) warm core: > 0 for TC
4. An additional, simple check of 300-500 mb warm core is shown on track plots, but is not used for genesis probabilities.

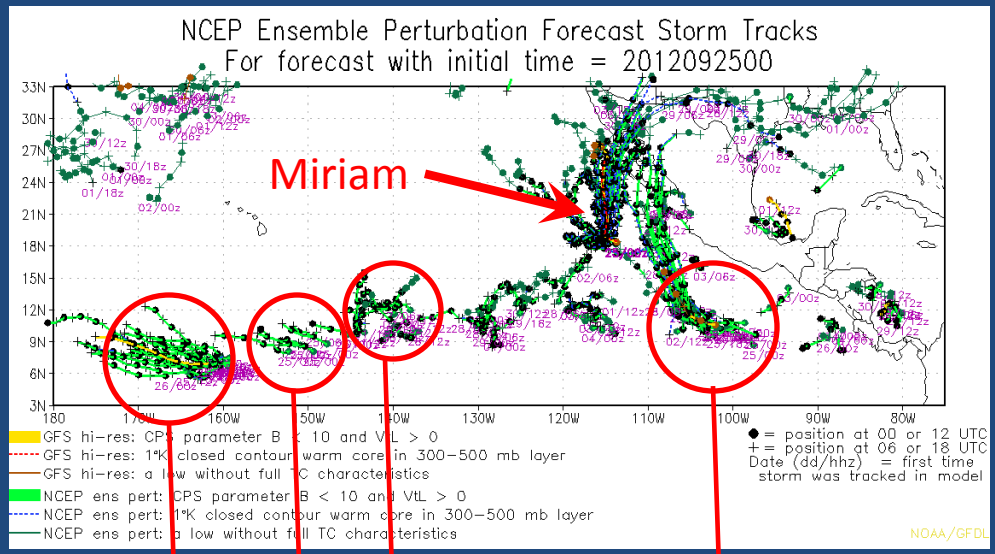
Compute genesis probabilities

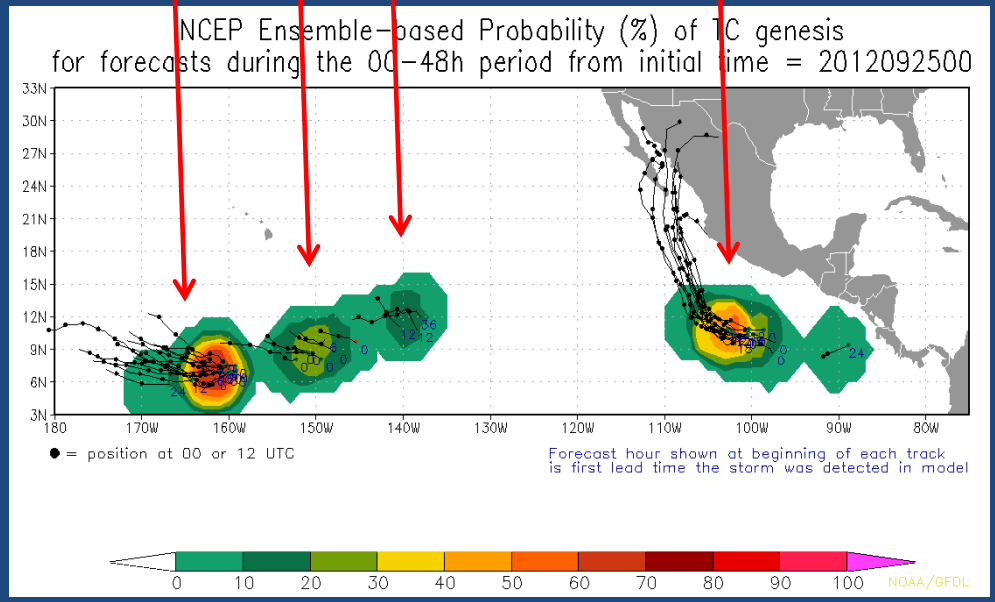
Calculate fraction of members indicating genesis within a 350 km radius of each grid point:

1. For each ensemble
2. For a consensus of the 4 global ensembles (equally weighted)
3. For a consensus of the 4 global deterministic models

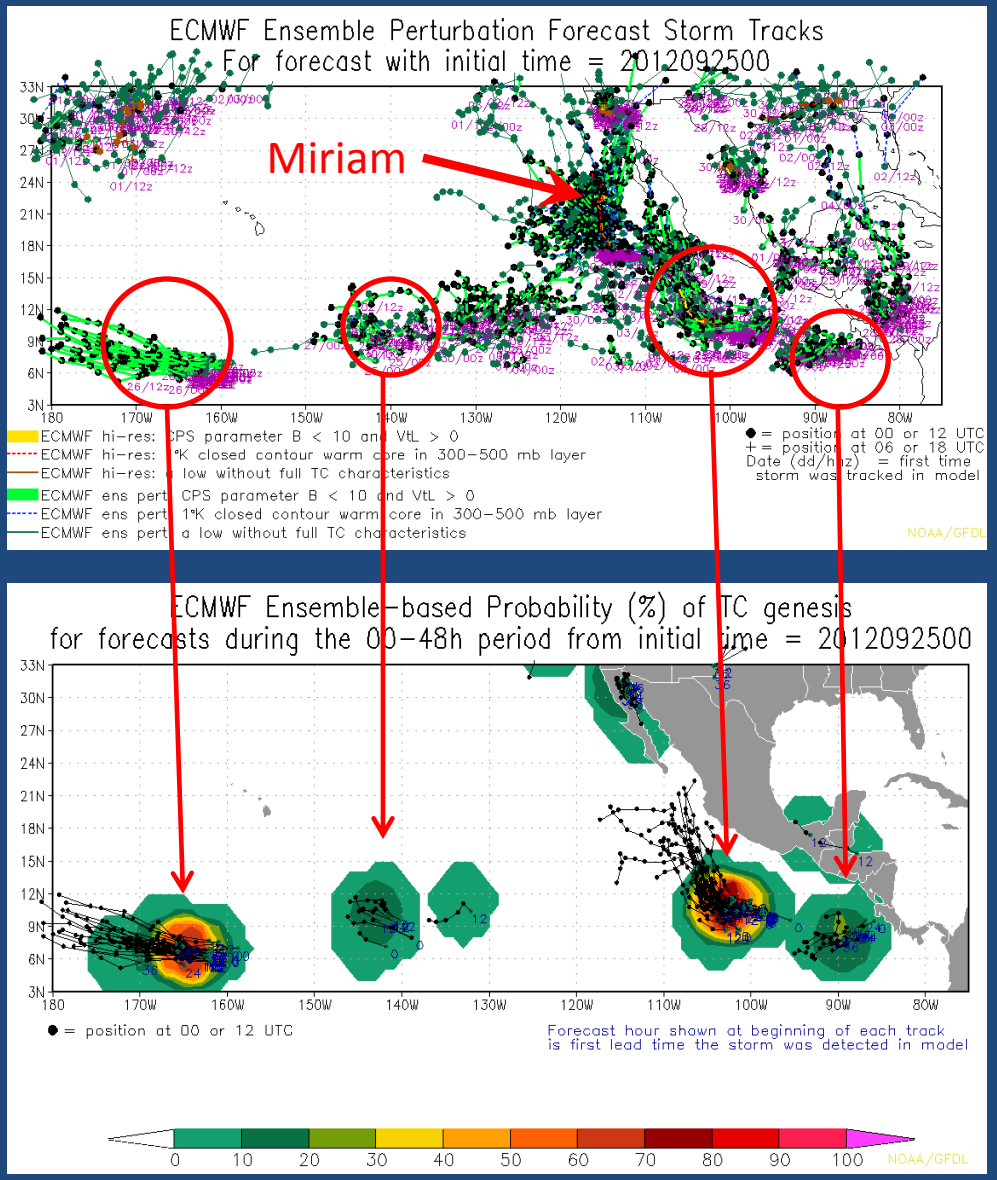
Example: 2012092500 NCEP Ensemble

Three different areas in the ITCZ south of Hawaii as well as an area off the coast of Central America lead to probabilities >10%.

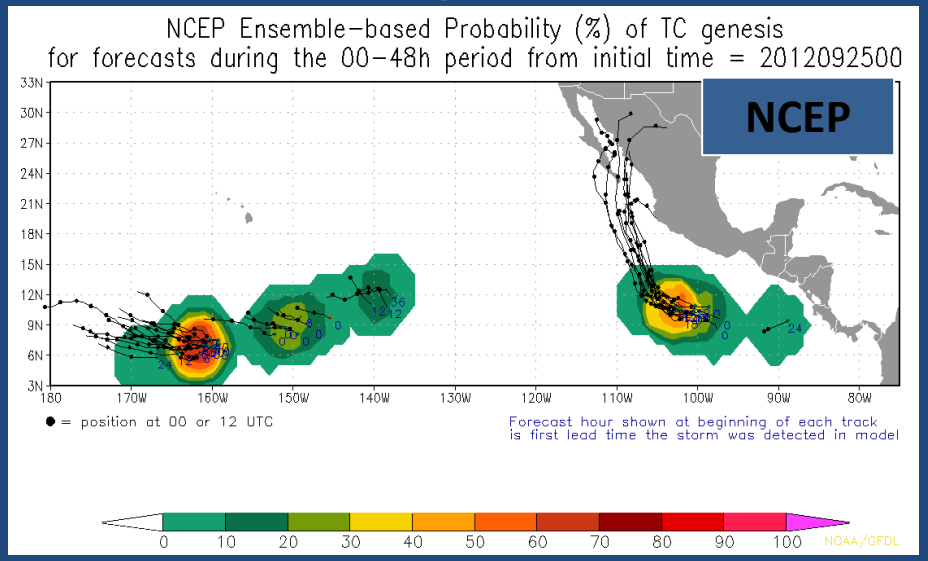


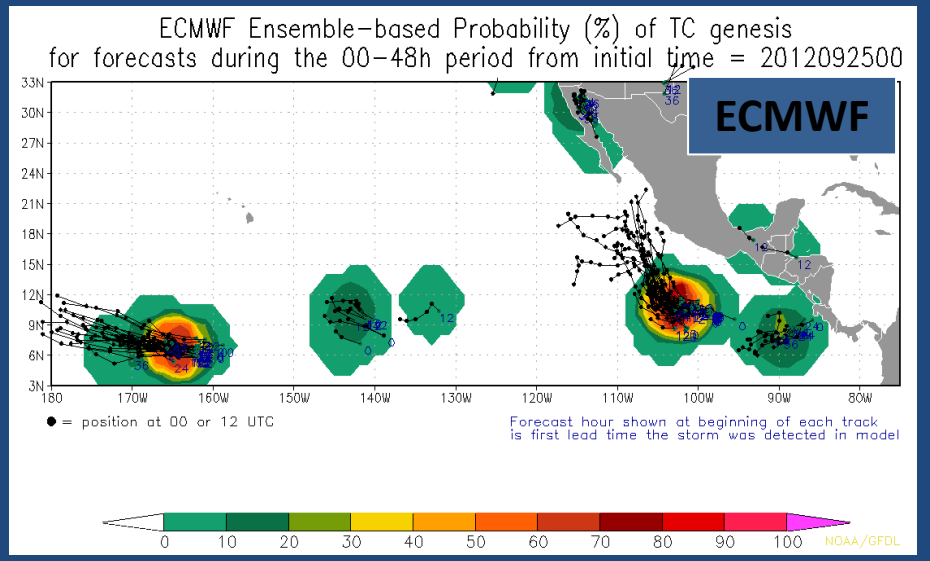


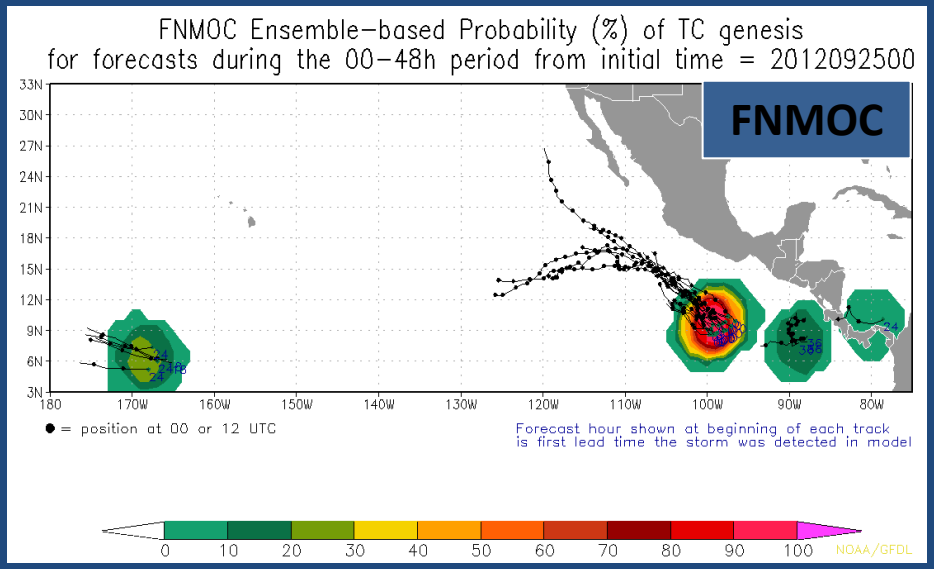
Example: 2012092500 ECMWF Ensemble

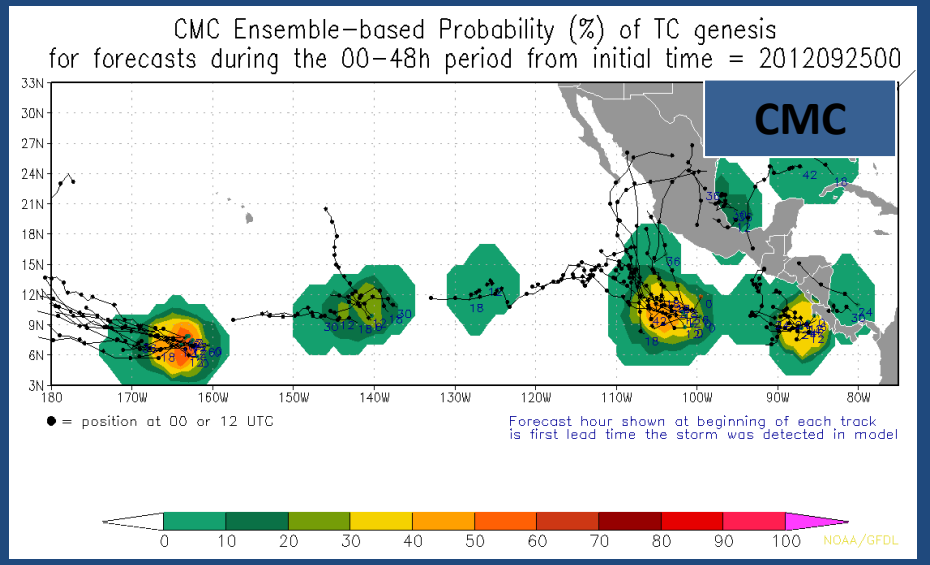


Genesis probabilities for 00-48h from all four global ensembles: 2012092500

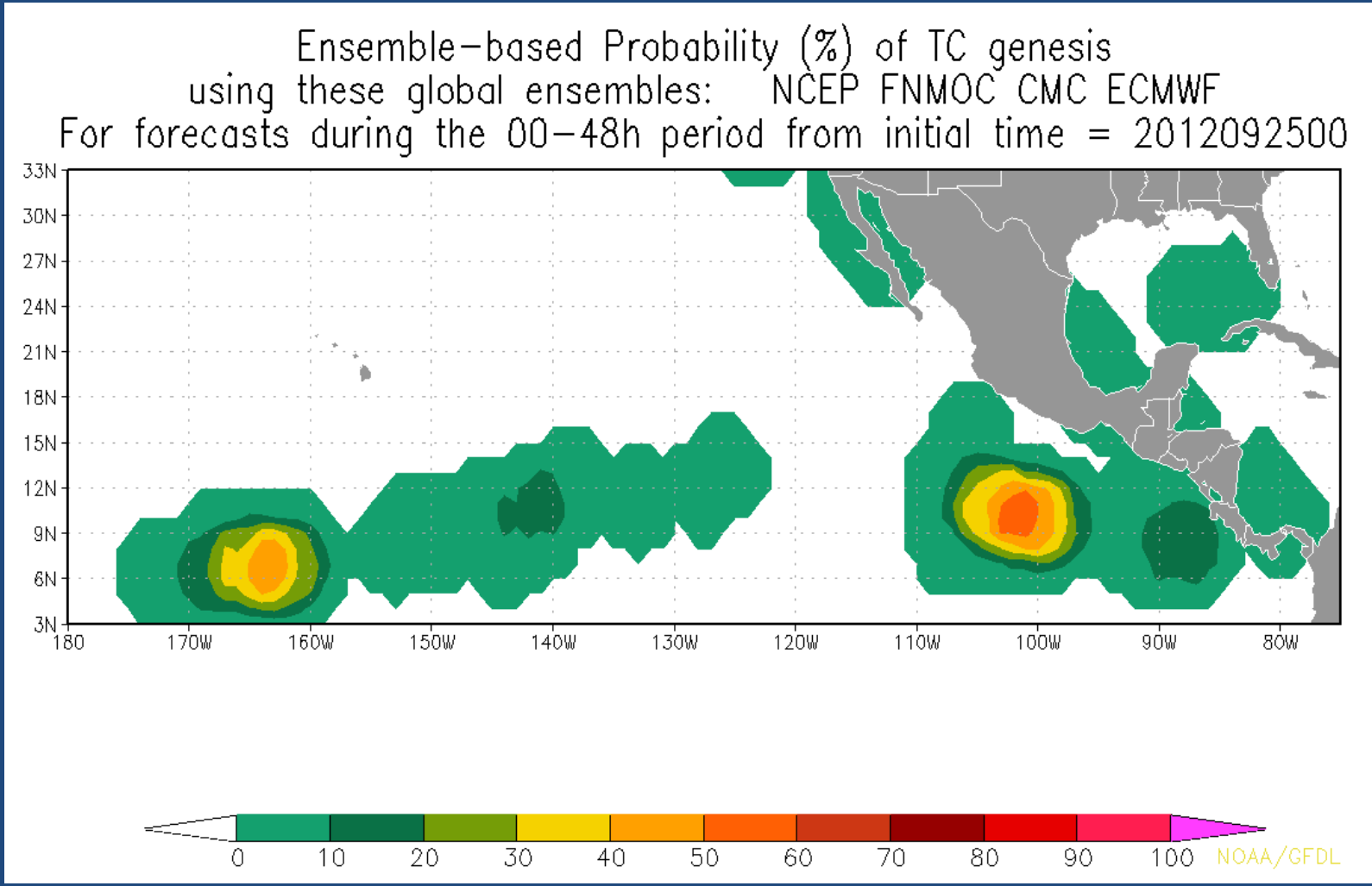






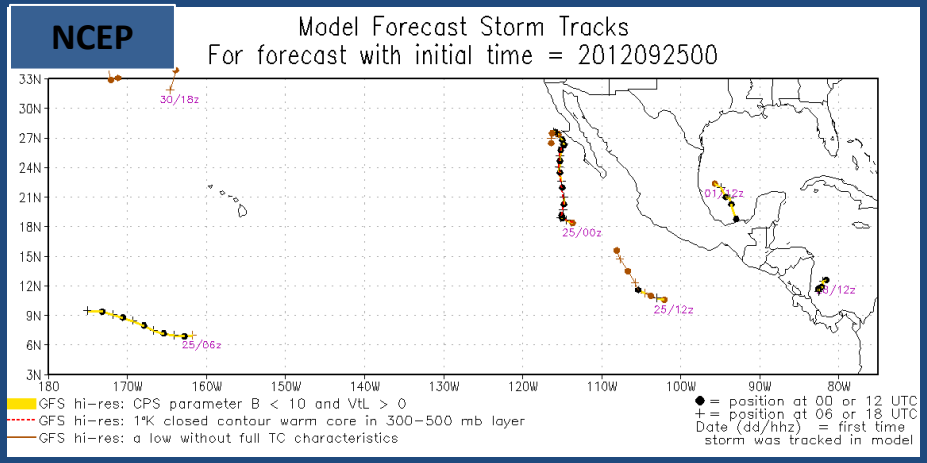


Consensus-based genesis probabilities for 00-48h using all four global ensembles: 2012092500

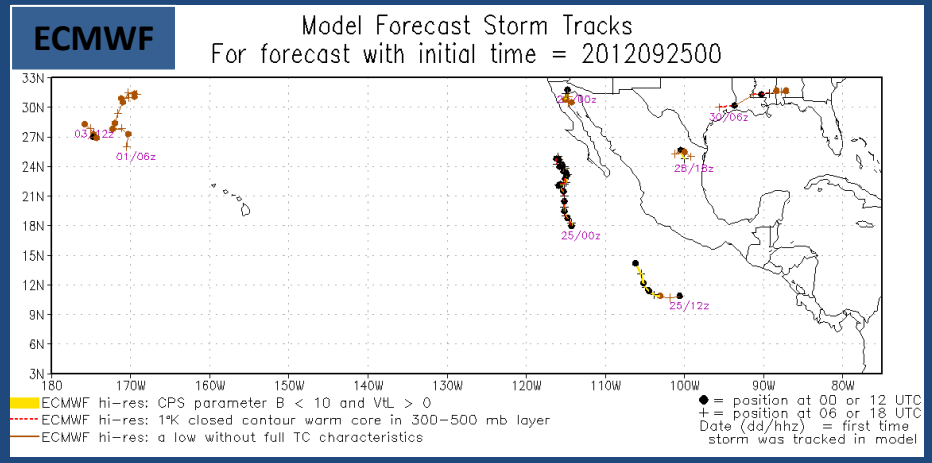


Forecast storm tracks from all four deterministic global models: 2012092500

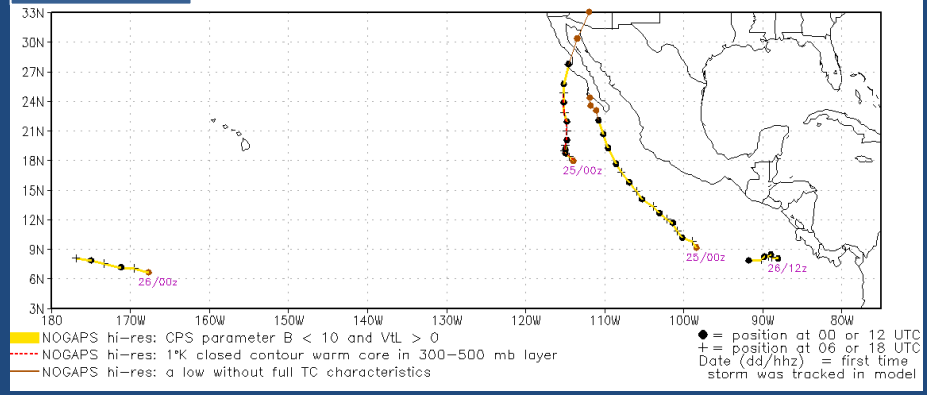
NCEP



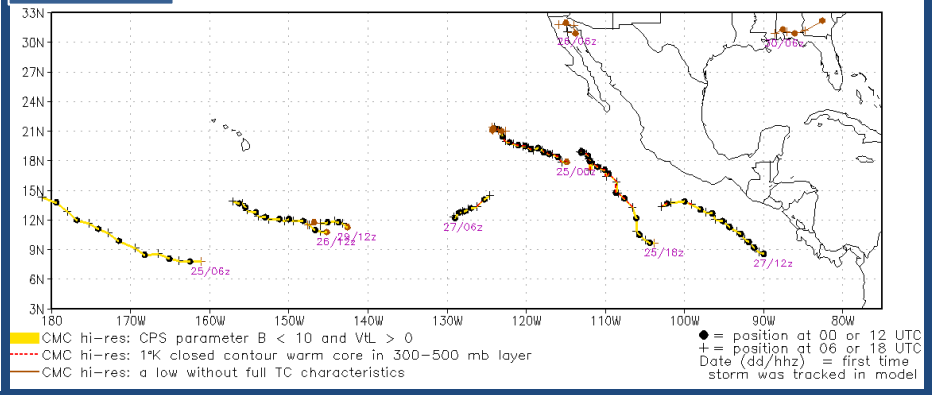
ECMWF



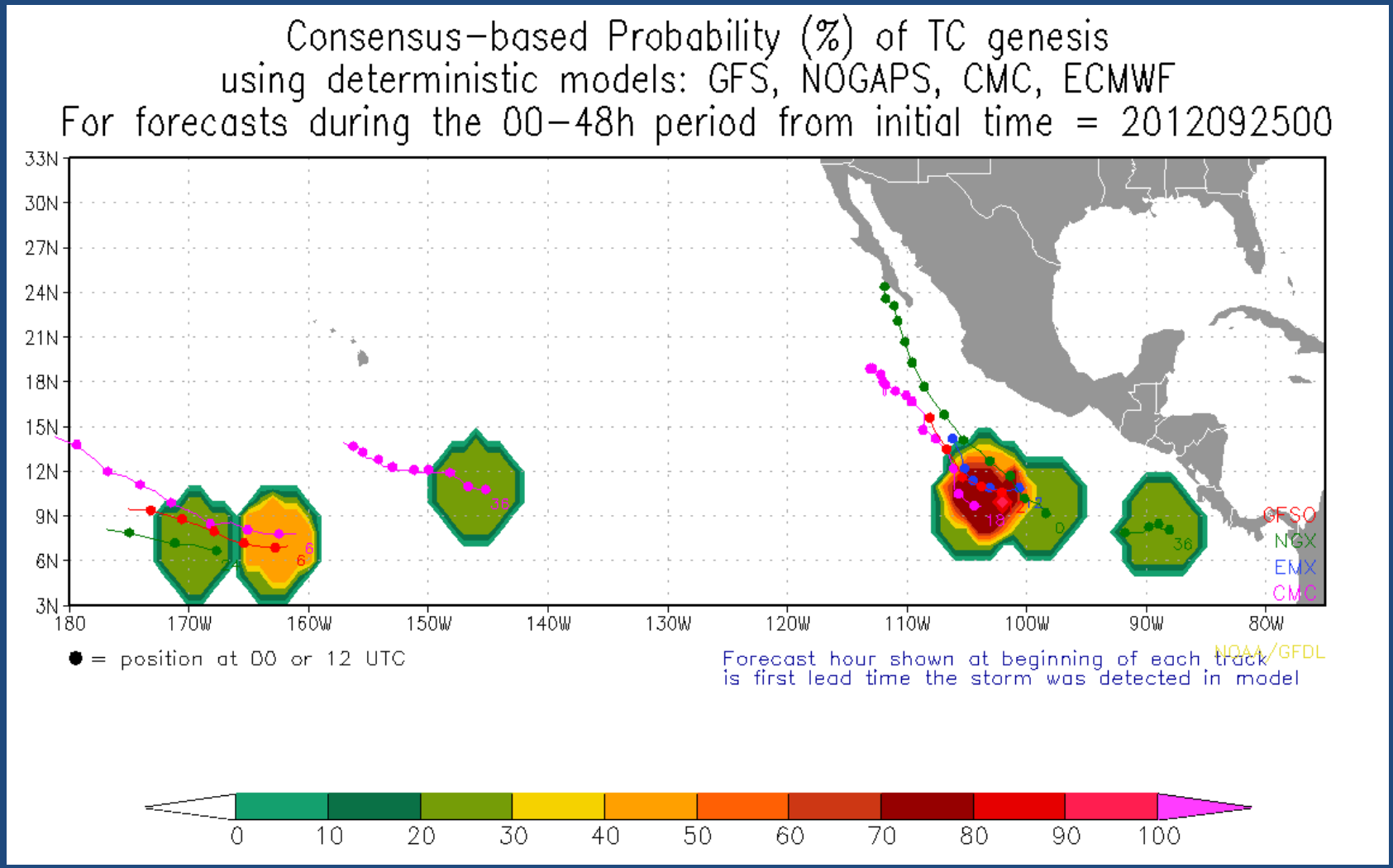
NOGAPS



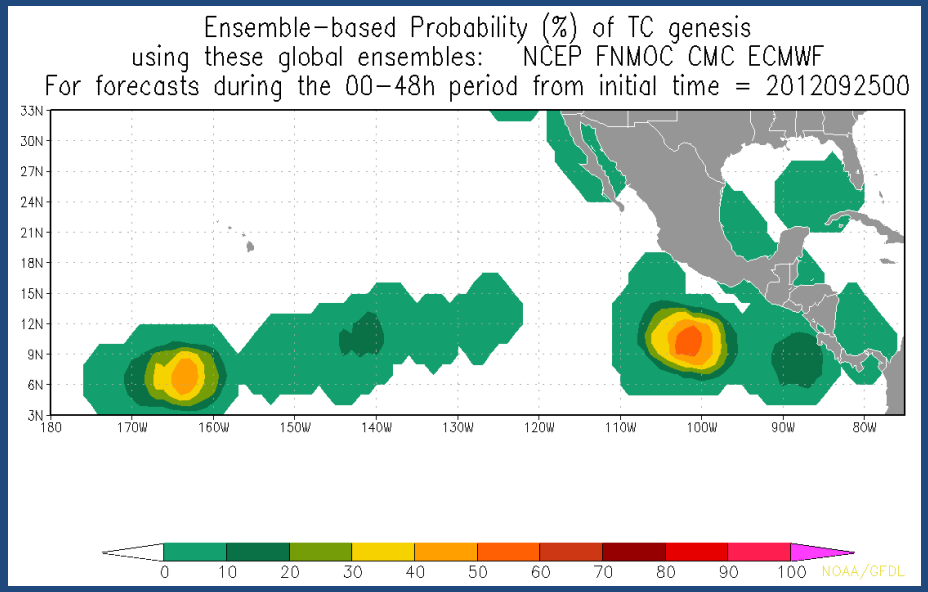
CMC

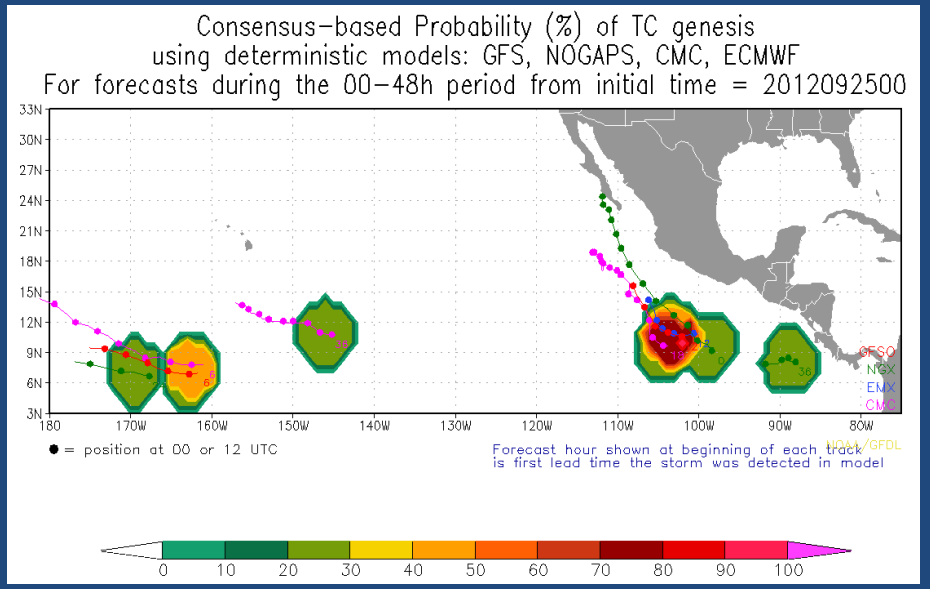


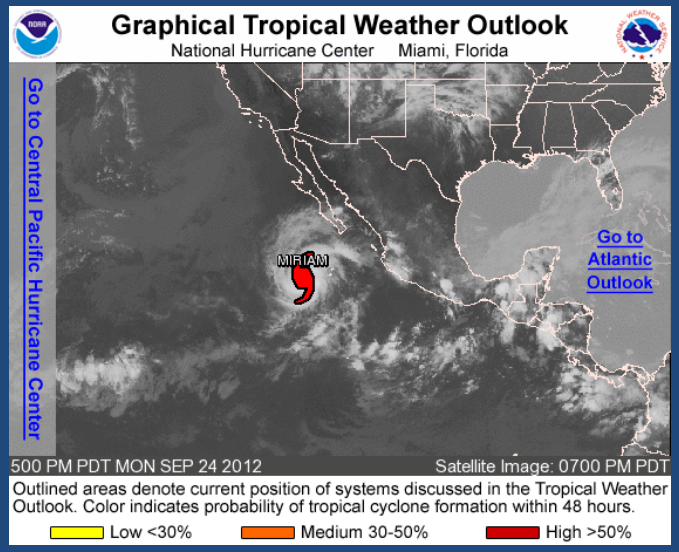
Consensus-based genesis probabilities for 00-48h using all four global deterministic models: 2012092500



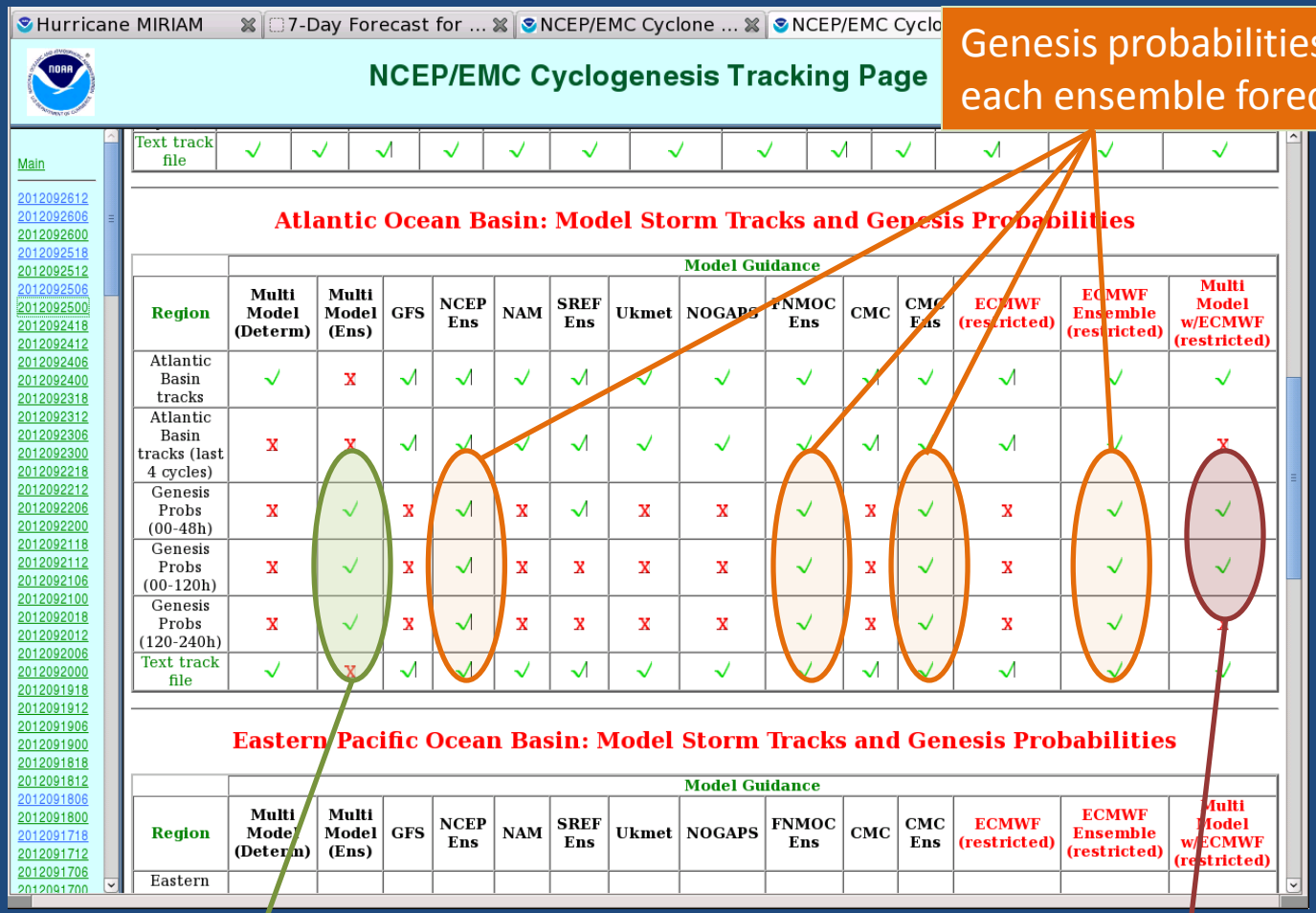
Ensemble-based and Consensus-based genesis probabilities for 2012092500: 00-48h







Website 1: http://www.emc.ncep.noaa.gov/gmb/tpm/emchurr/tcgen



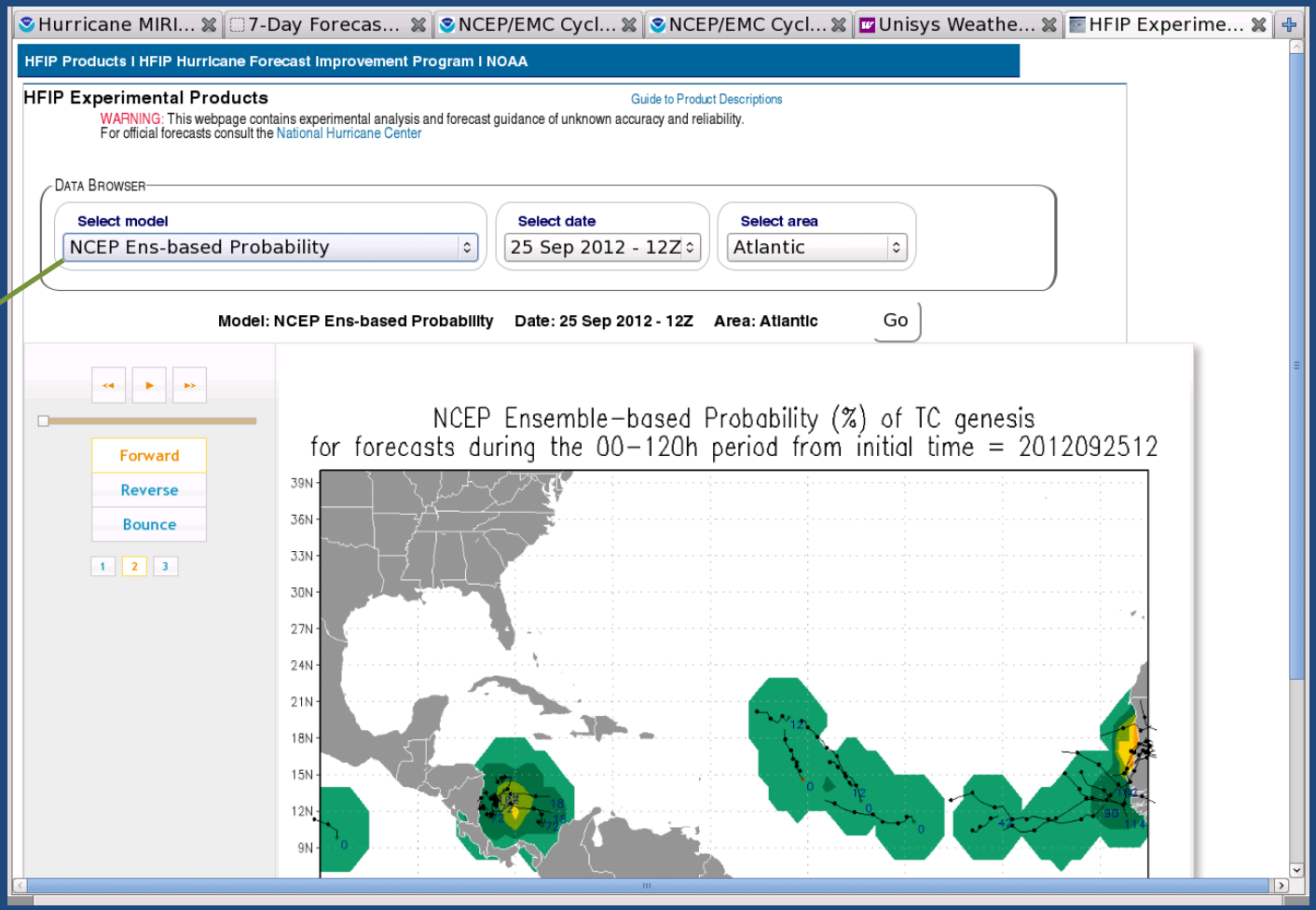
Genesis probabilities based on each ensemble forecast system

Genesis probabilities based on consensus of ensemble forecasts

Genesis probabilities based on consensus of deterministic forecasts

Website 2: http://www.hfip.org/data_prob

Paula McCaslin built a very nice interface for looping through images based on model or lead time.



Summary

1. Consensus-based approach to provide genesis probability guidance using global deterministic and ensemble forecast systems.

2. Cyclones are detected with the tracker and categorized using parameters from cyclone phase space.
   - May need to adjust use of cyclone phase space depending on results

3. Bug fix necessary in order to include genesis probabilities for Invest systems.