

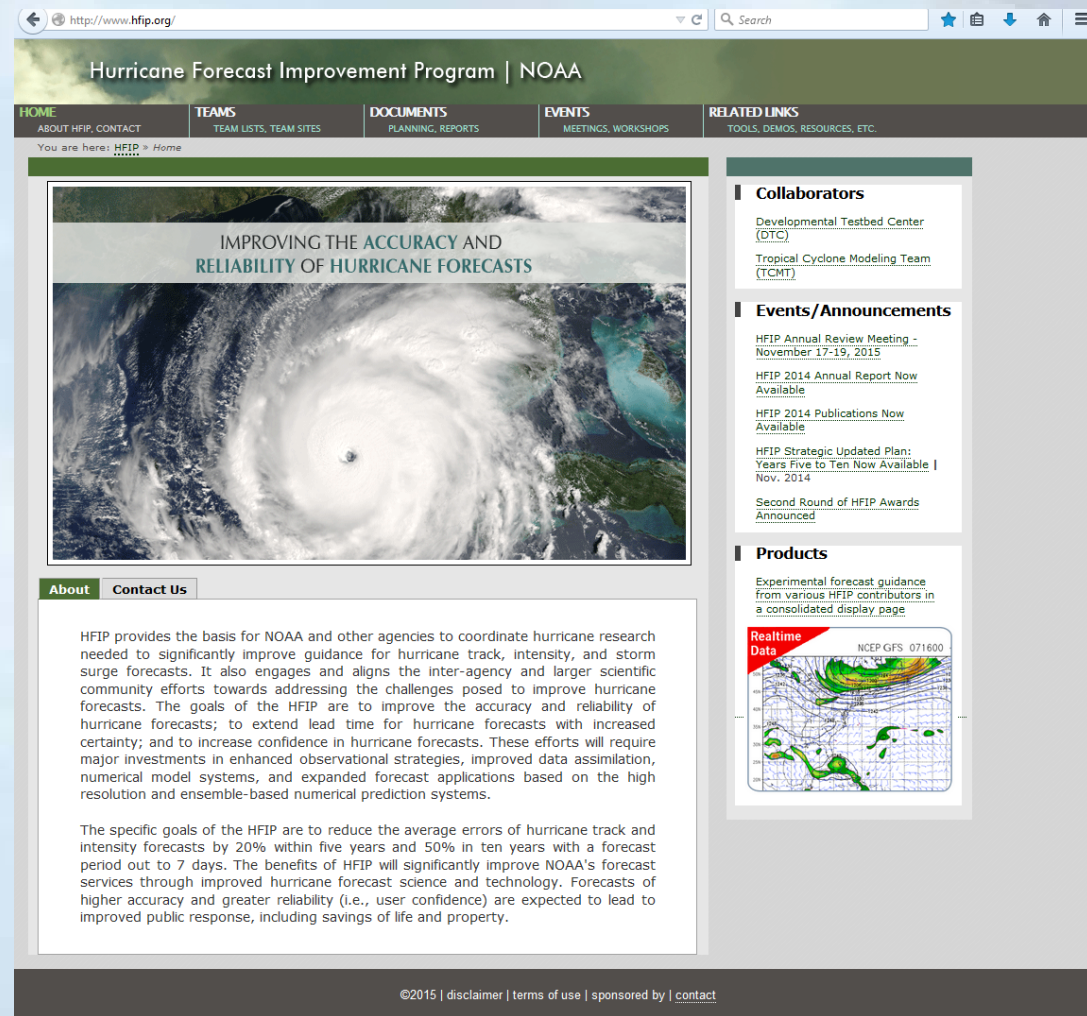
# HFIP Web Support and Display and Diagnostic System Development

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NCAR/Research Applications Laboratory

**HFIP Annual Meeting**  
**Miami, FL**  
**18 November 2015**

# HFIP Project Office Support

- HFIP website development and maintenance
- HFIP team group email management
- HFIP workshop support
- HFIP database development
- Development of web-based display and diagnostic system



The screenshot displays the homepage of the Hurricane Forecast Improvement Program (HFIP) website. The browser address bar shows the URL <http://www.hfip.org>. The page header features the title "Hurricane Forecast Improvement Program | NOAA". Below the header is a navigation menu with categories: HOME (ABOUT HFIP, CONTACT), TEAMS (TEAM LISTS, TEAM SITES), DOCUMENTS (PLANNING, REPORTS), EVENTS (MEETINGS, WORKSHOPS), and RELATED LINKS (TOOLS, DEMOS, RESOURCES, ETC.). A breadcrumb trail indicates the user is on the Home page.

The main content area is dominated by a large satellite image of a hurricane. Overlaid on the image is the text: "IMPROVING THE ACCURACY AND RELIABILITY OF HURRICANE FORECASTS". Below the image are two tabs: "About" and "Contact Us". The "About" tab is active, displaying a paragraph of text:

HFIP provides the basis for NOAA and other agencies to coordinate hurricane research needed to significantly improve guidance for hurricane track, intensity, and storm surge forecasts. It also engages and aligns the inter-agency and larger scientific community efforts towards addressing the challenges posed to improve hurricane forecasts. The goals of the HFIP are to improve the accuracy and reliability of hurricane forecasts; to extend lead time for hurricane forecasts with increased certainty; and to increase confidence in hurricane forecasts. These efforts will require major investments in enhanced observational strategies, improved data assimilation, numerical model systems, and expanded forecast applications based on the high resolution and ensemble-based numerical prediction systems.

The specific goals of the HFIP are to reduce the average errors of hurricane track and intensity forecasts by 20% within five years and 50% in ten years with a forecast period out to 7 days. The benefits of HFIP will significantly improve NOAA's forecast services through improved hurricane forecast science and technology. Forecasts of higher accuracy and greater reliability (i.e., user confidence) are expected to lead to improved public response, including savings of life and property.

On the right side of the page, there are three sections:

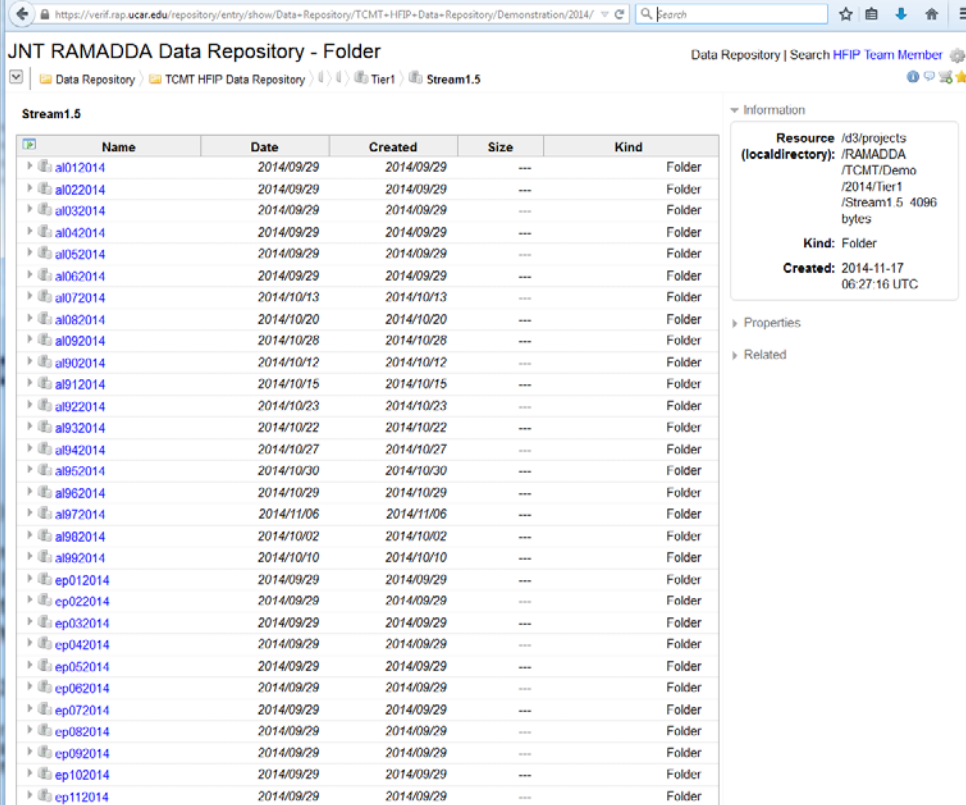
- Collaborators:** Links to Developmental Testbed Center (DTC) and Tropical Cyclone Modeling Team (TCMT).
- Events/Announcements:** A list of recent events and reports, including "HFIP Annual Review Meeting - November 17-19, 2015", "HFIP 2014 Annual Report Now Available", "HFIP 2014 Publications Now Available", "HFIP Strategic Updated Plan: Years Five to Ten Now Available | Nov. 2014", and "Second Round of HFIP Awards Announced".
- Products:** A link to "Experimental forecast guidance from various HFIP contributors in a consolidated display page".

At the bottom right, there is a "Realtime Data" section featuring a map titled "NCEP GFS 071600" showing a hurricane track and intensity forecast over the Caribbean and Atlantic regions.

The footer of the page contains the copyright notice: ©2015 | disclaimer | terms of use | sponsored by | contact

# HFIP Data Service

- Available data include:
  - Tier 1 (Stream 1, 1.5, and 2) and diagnostic files
  - 2010-2014 Retrospective periods
  - 2011-2015 Demonstration periods
- Designed using RAMADDA database system framework
- Improved access for selecting and downloading data
- Future Enhancements
  - Access to Tier 2 and forecast product imagery through an online ordering system.
  - Tier 2 data products stored at NCAR Mass Store system



The screenshot shows a web browser window displaying the JNT RAMADDA Data Repository. The URL is <https://verif.rap.ucar.edu/repository/entry/show/Data+Repository/TCMT+HFIP+Data+Repository/Demonstration/2014/>. The page title is "JNT RAMADDA Data Repository - Folder". The breadcrumb trail is "Data Repository > TCMT HFIP Data Repository > Tier1 > Stream1.5". The main content is a table of folders for "Stream1.5".

Name	Date	Created	Size	Kind
ai012014	2014/09/29	2014/09/29	---	Folder
ai022014	2014/09/29	2014/09/29	---	Folder
ai032014	2014/09/29	2014/09/29	---	Folder
ai042014	2014/09/29	2014/09/29	---	Folder
ai052014	2014/09/29	2014/09/29	---	Folder
ai062014	2014/09/29	2014/09/29	---	Folder
ai072014	2014/10/13	2014/10/13	---	Folder
ai082014	2014/10/20	2014/10/20	---	Folder
ai092014	2014/10/28	2014/10/28	---	Folder
ai902014	2014/10/12	2014/10/12	---	Folder
ai912014	2014/10/15	2014/10/15	---	Folder
ai922014	2014/10/23	2014/10/23	---	Folder
ai932014	2014/10/22	2014/10/22	---	Folder
ai942014	2014/10/27	2014/10/27	---	Folder
ai952014	2014/10/30	2014/10/30	---	Folder
ai962014	2014/10/29	2014/10/29	---	Folder
ai972014	2014/11/06	2014/11/06	---	Folder
ai982014	2014/10/02	2014/10/02	---	Folder
ai992014	2014/10/10	2014/10/10	---	Folder
ep012014	2014/09/29	2014/09/29	---	Folder
ep022014	2014/09/29	2014/09/29	---	Folder
ep032014	2014/09/29	2014/09/29	---	Folder
ep042014	2014/09/29	2014/09/29	---	Folder
ep052014	2014/09/29	2014/09/29	---	Folder
ep062014	2014/09/29	2014/09/29	---	Folder
ep072014	2014/09/29	2014/09/29	---	Folder
ep082014	2014/09/29	2014/09/29	---	Folder
ep092014	2014/09/29	2014/09/29	---	Folder
ep102014	2014/09/29	2014/09/29	---	Folder
ep112014	2014/09/29	2014/09/29	---	Folder

Information panel on the right shows:  
Resource: /d3/projects /RAMADDA /TCMT/Demo /2014/Tier1 /Stream1.5 4096 bytes  
Kind: Folder  
Created: 2014-11-17 06:27:16 UTC

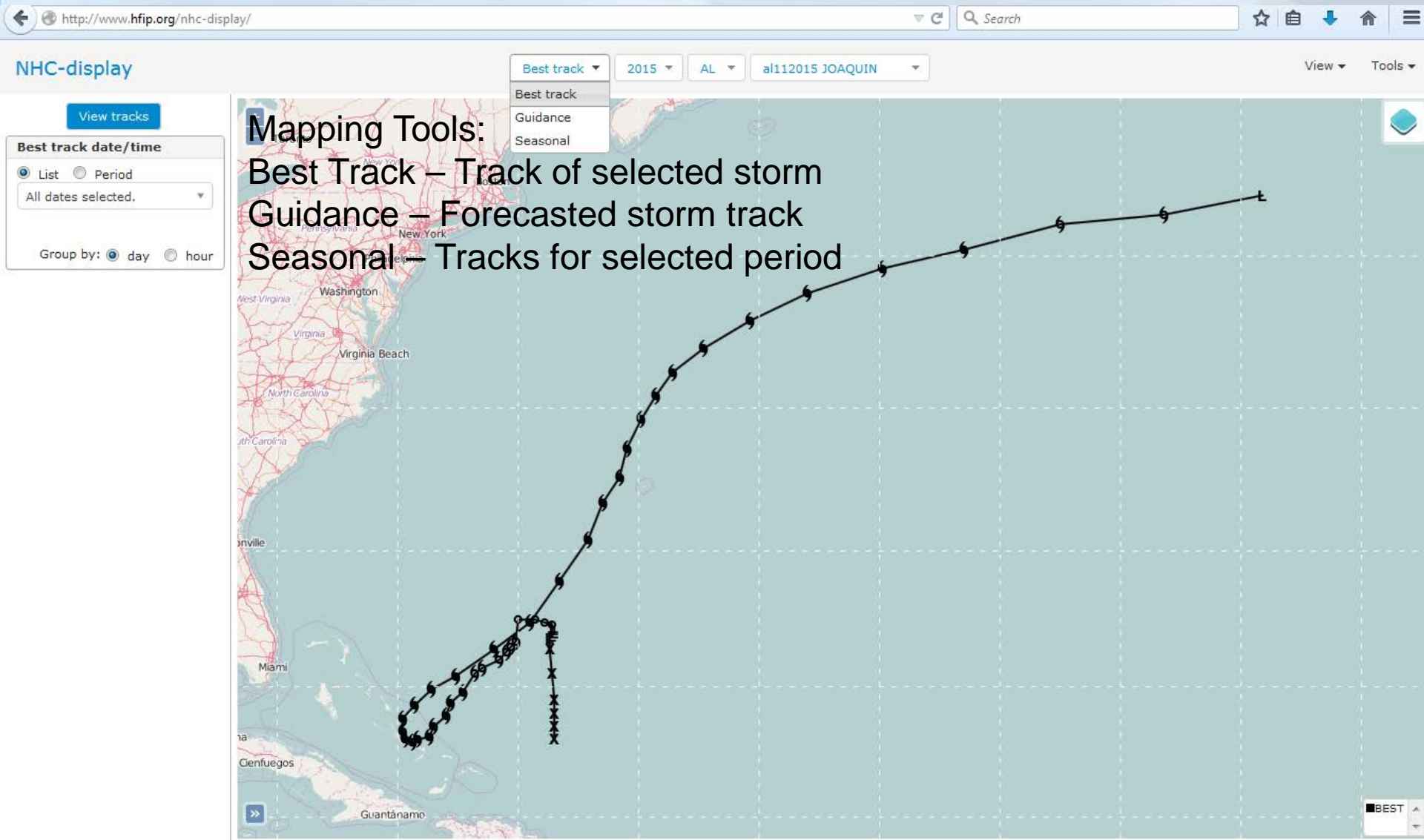
<https://verif.rap.ucar.edu/repository>

# Web-based Display and Diagnostic System Development

- **Developed a web-based display and diagnostic system to support NHC and for the hurricane community**
- **Display is designed using modular and flexible technology:**
  - OpenLayers Mapping tools
    - Platform independent, no license requirements
  - MySQL database
  - Primary input: ATCF files
- **Diagnostic evaluation tools**
- **Consensus forecasts**
- **Gridded Fields**
  - Sea Surface Temperature (SST)
- **Ongoing Development**
  - Gridded fields
    - Forecast products
    - Satellite observations
  - Additional Diagnostic Tools
- **Complement the ATCF display system and the HFIP products page**

Real-time access through the HFIP webpage:  
- <http://www.hfip.org/nhc-display/>

# Display System Overview



# Display System Overview

http://www.hfip.org/nhc-display/

NHC-display Best track 2015 AL al112015 JOAQUIN View Tools

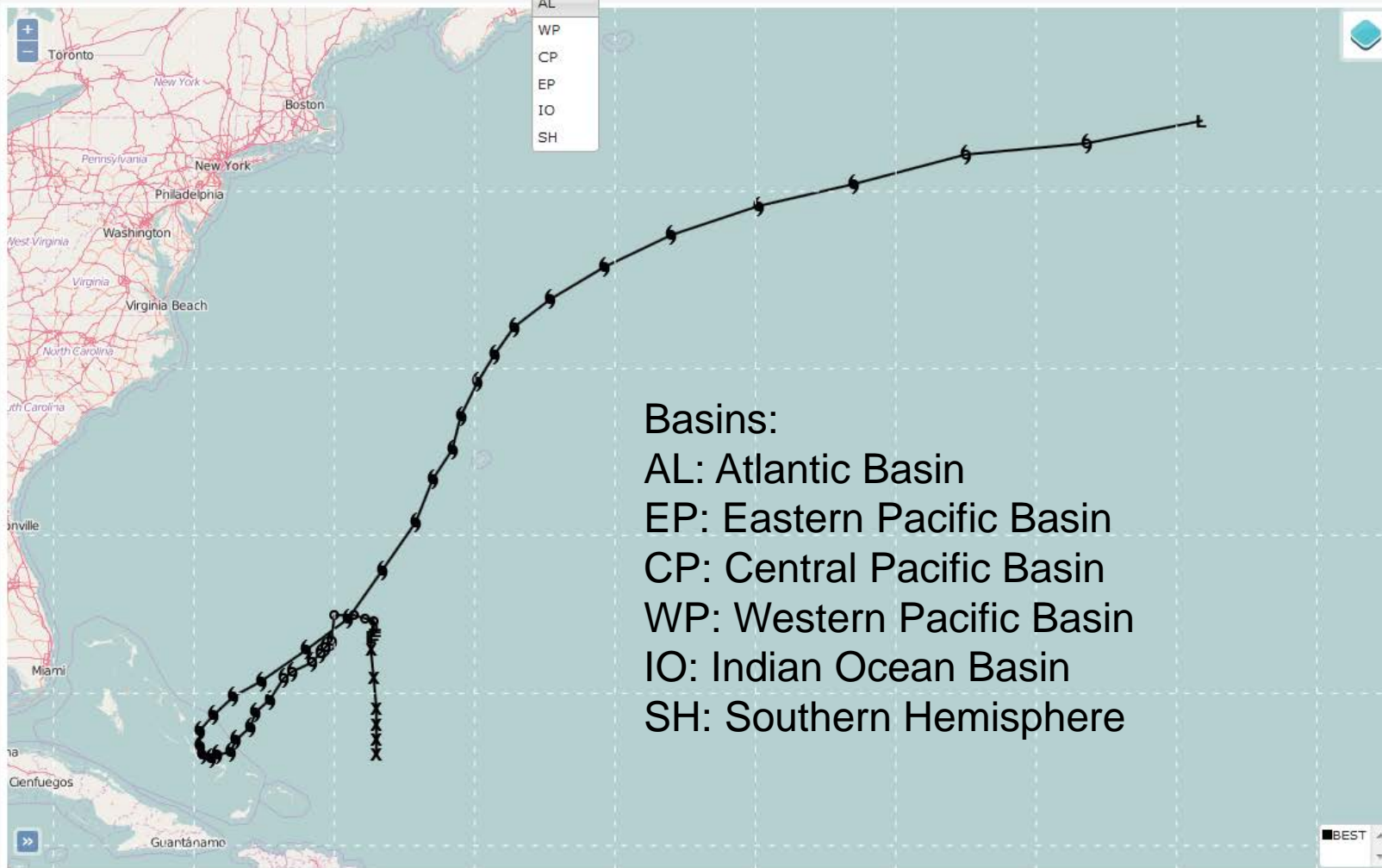
View tracks

Best track date/time

List  Period

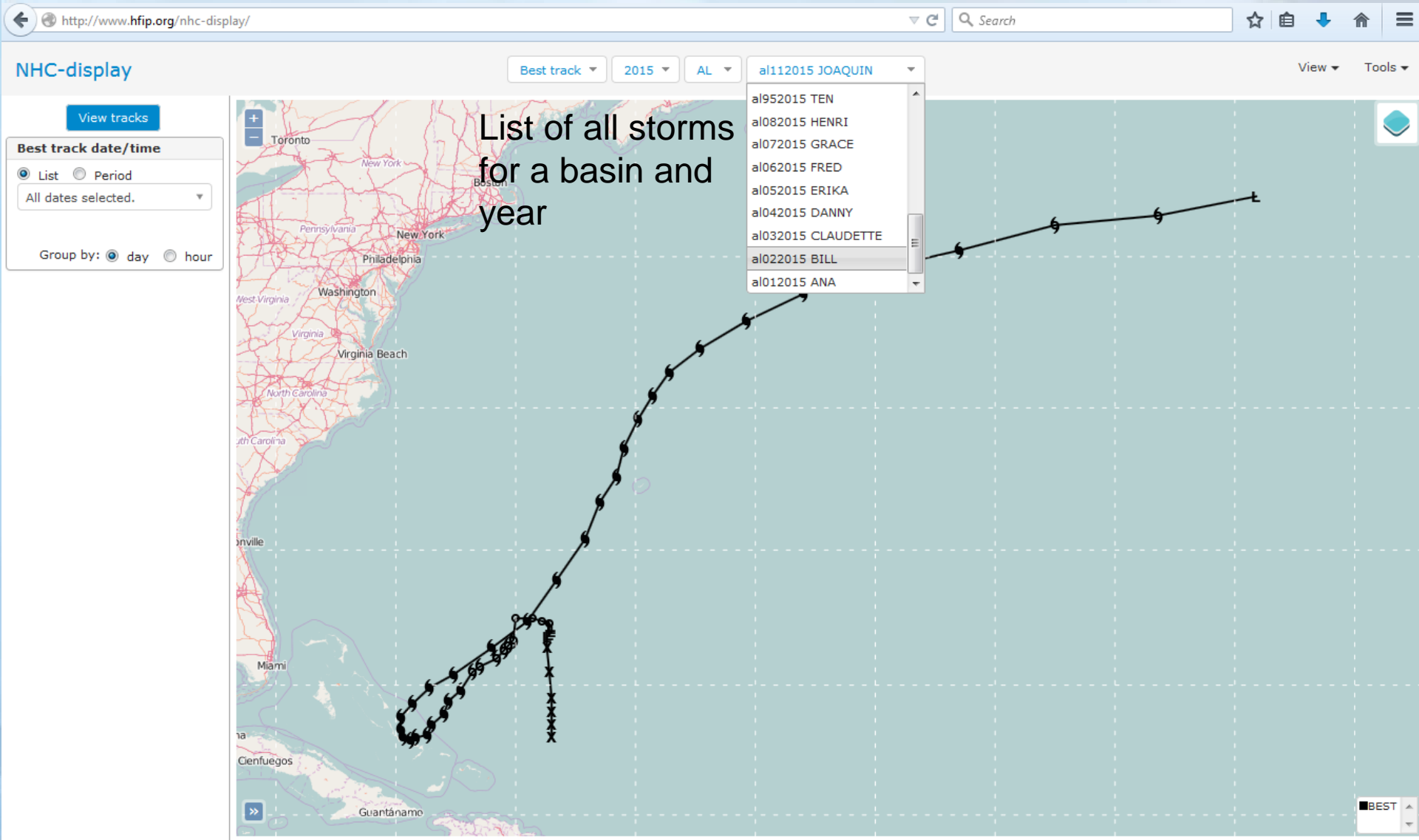
All dates selected.

Group by:  day  hour

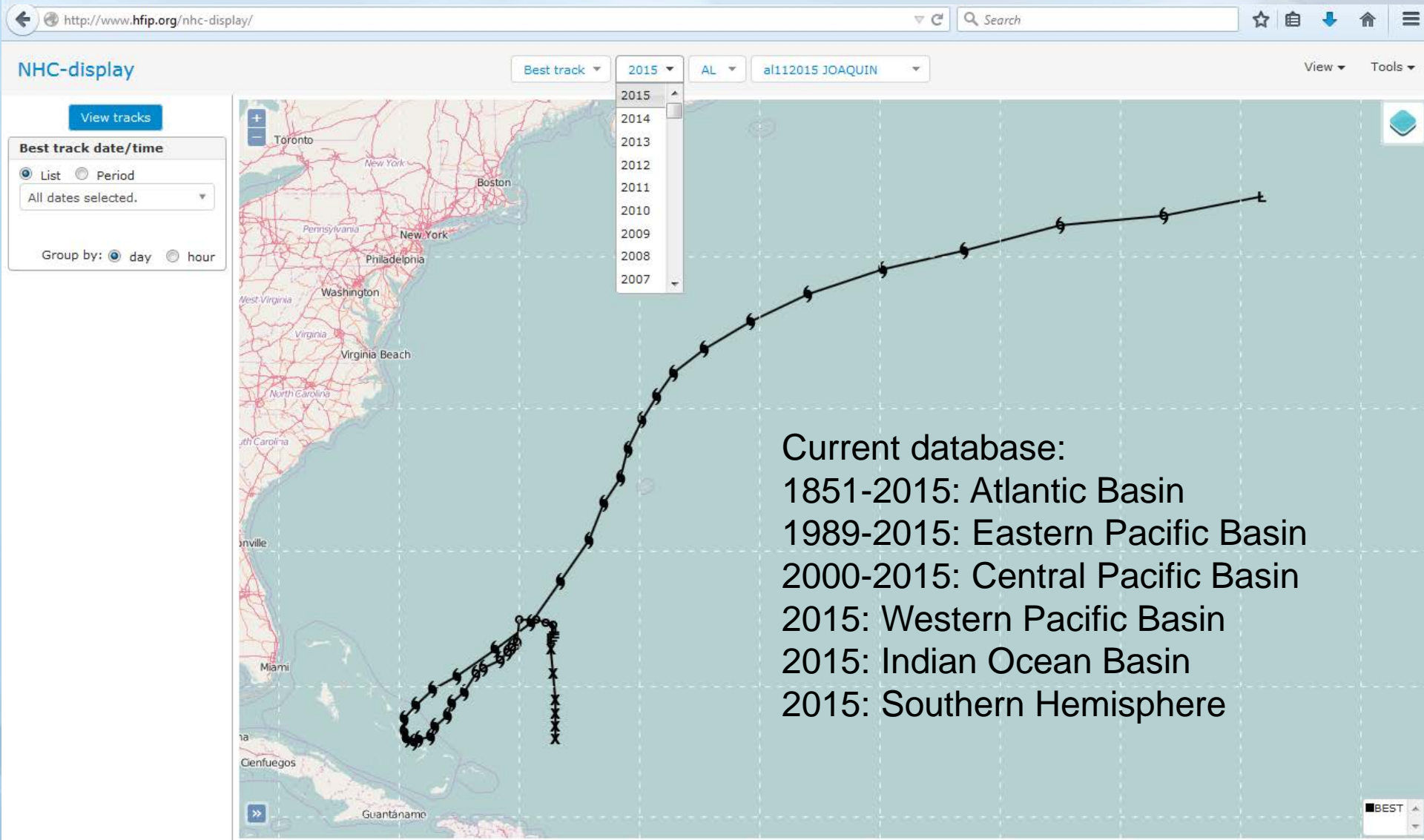


Basins:  
AL: Atlantic Basin  
EP: Eastern Pacific Basin  
CP: Central Pacific Basin  
WP: Western Pacific Basin  
IO: Indian Ocean Basin  
SH: Southern Hemisphere

# Display System Overview



# Display System Overview





# Seasonal Track Plotting

NHC-display

Seasonal 1853 AL All events selected.

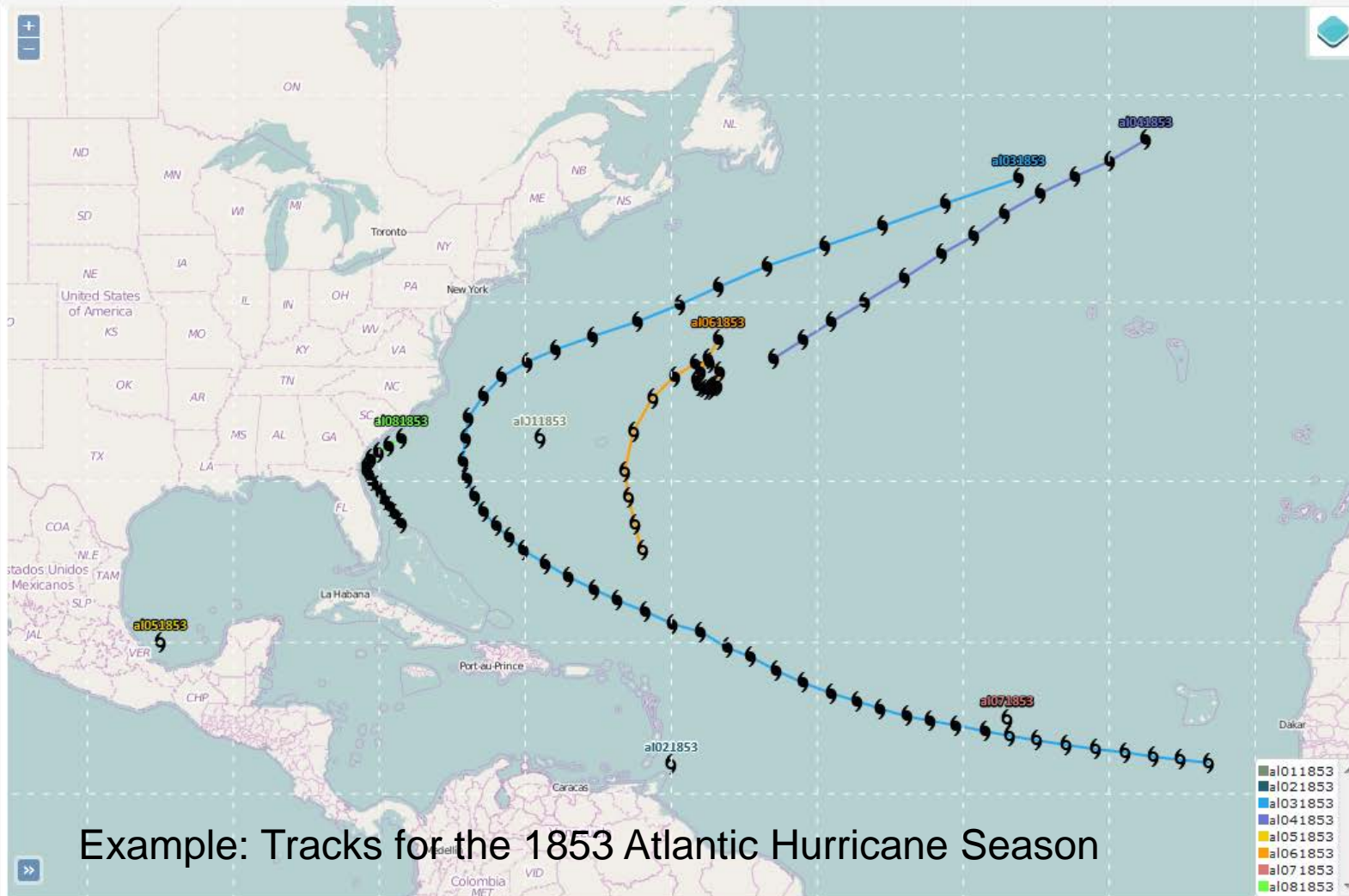
View Tools

View tracks

Period

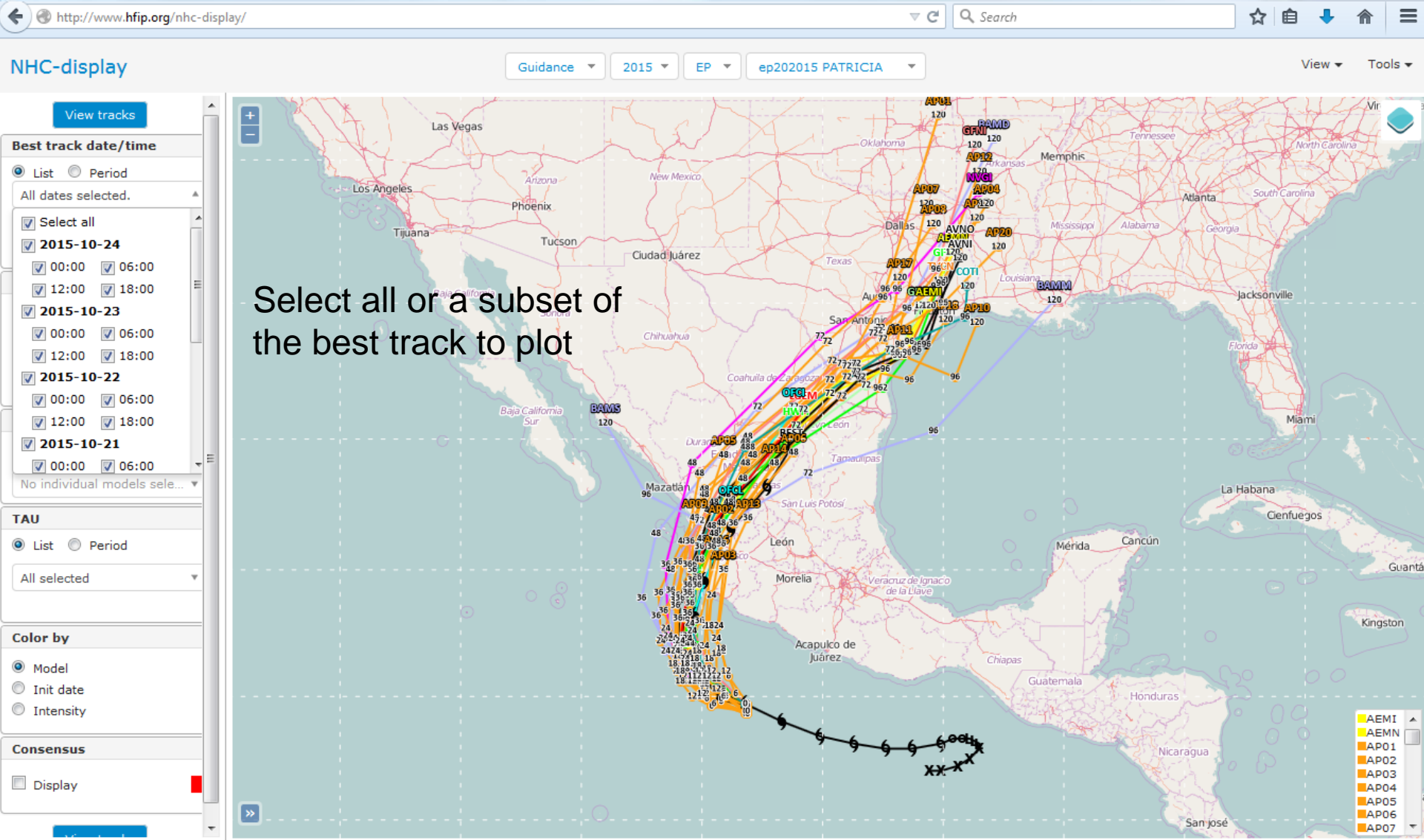
From: 1853-01-01

To: 1853-12-31

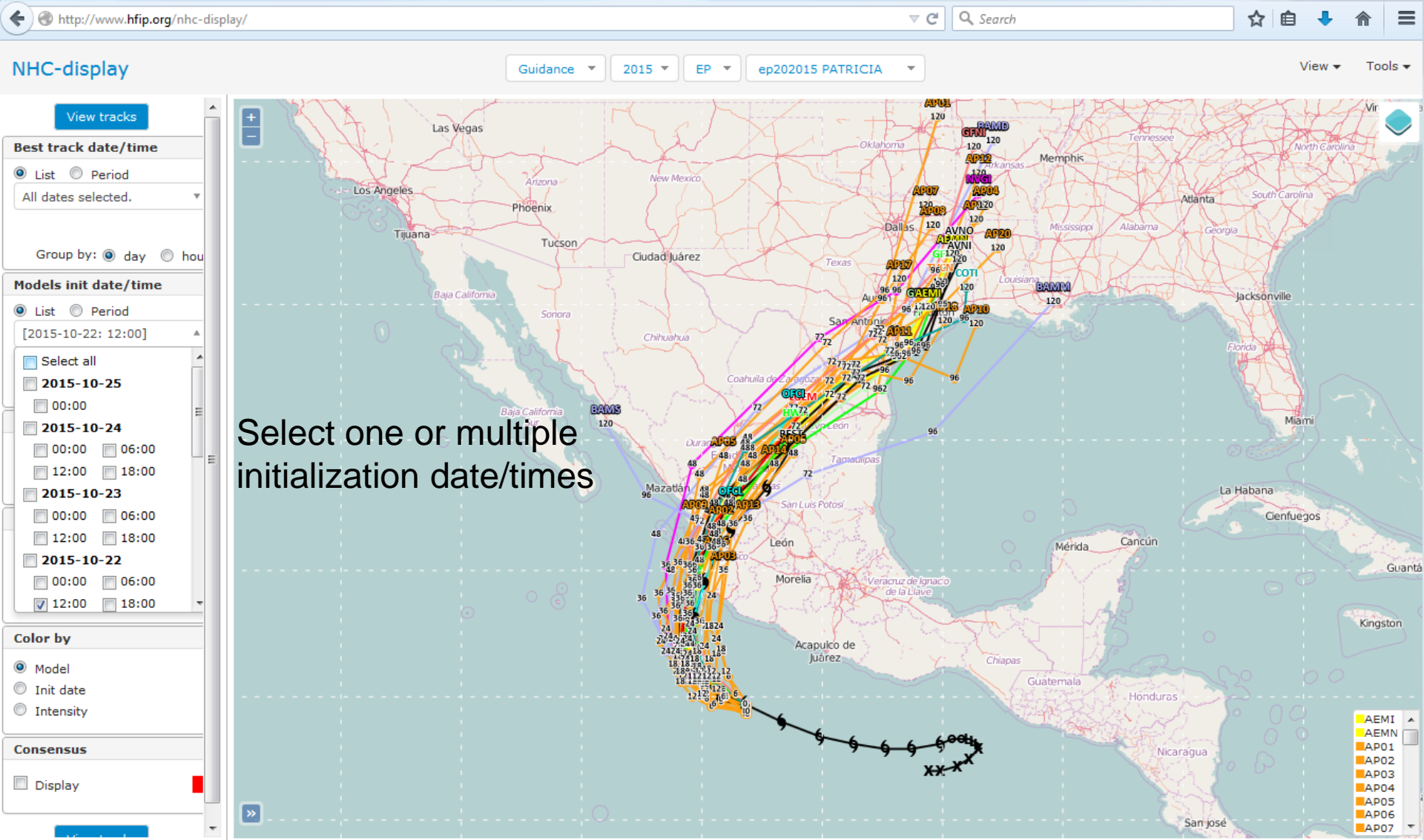


Example: Tracks for the 1853 Atlantic Hurricane Season

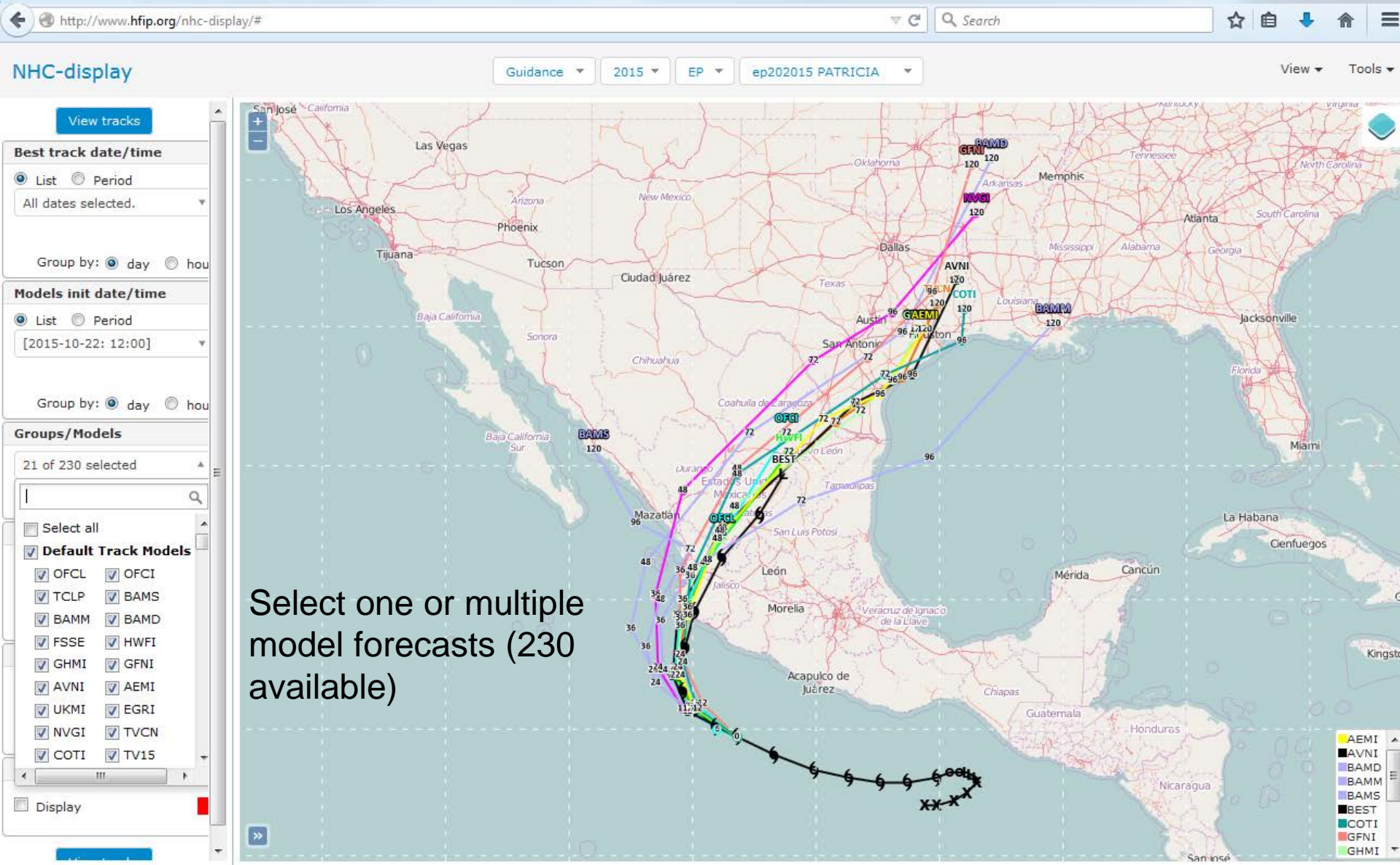
# Forecast Guidance



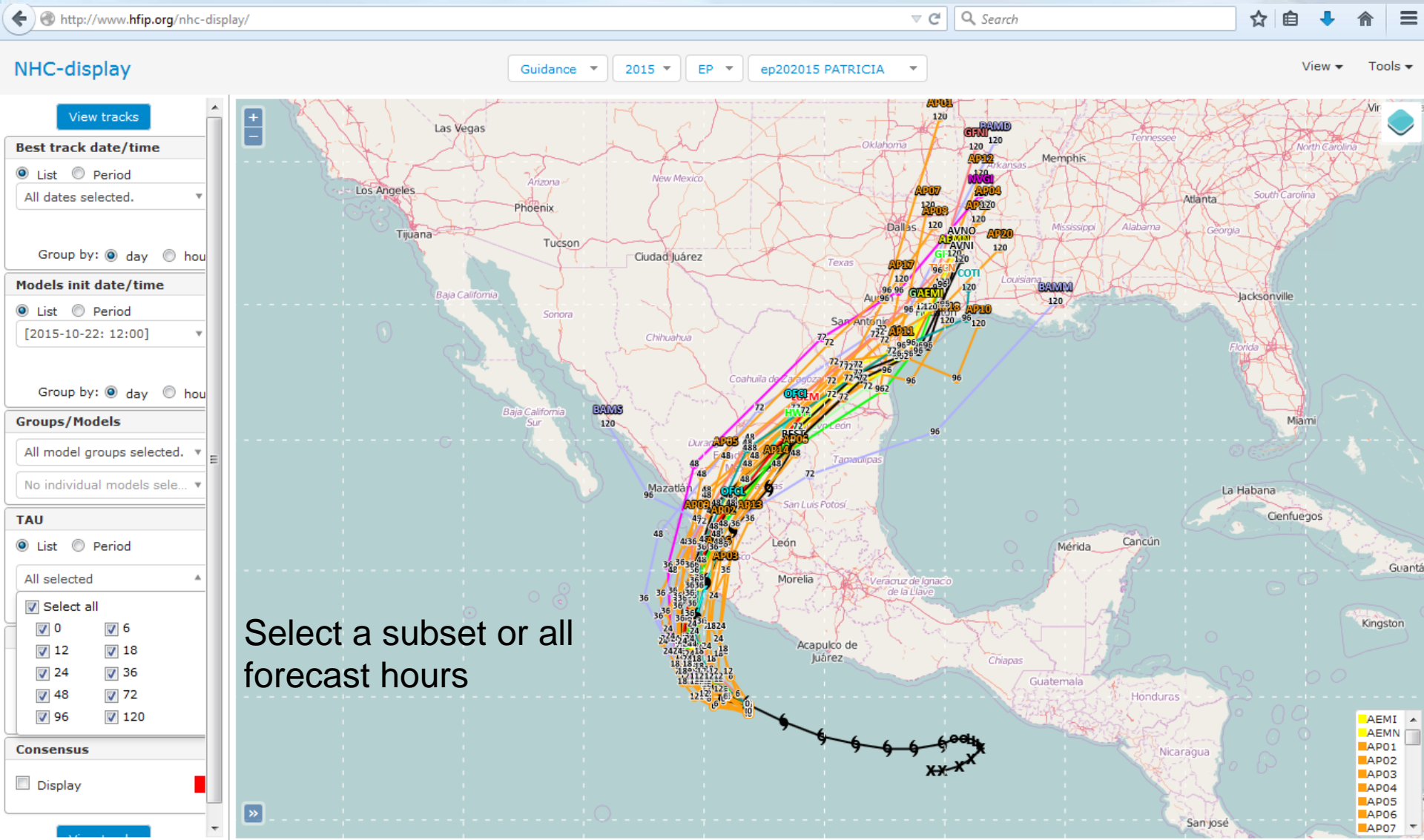
# Forecast Guidance



# Forecast Guidance



# Forecast Guidance



# Consensus Forecasts

http://www.hfip.org/nhc-display/#

NHC-display

Guidance 2015 EP ep202015 PATRICIA

View Tools

View tracks

Best track date/time

List Period

All dates selected.

Group by: day hour

Models init date/time

List Period

[2015-10-22: 12:00]

Group by: day hour

Groups/Models

All model groups selected.

No individual models selected.

TAU

List Period

All selected

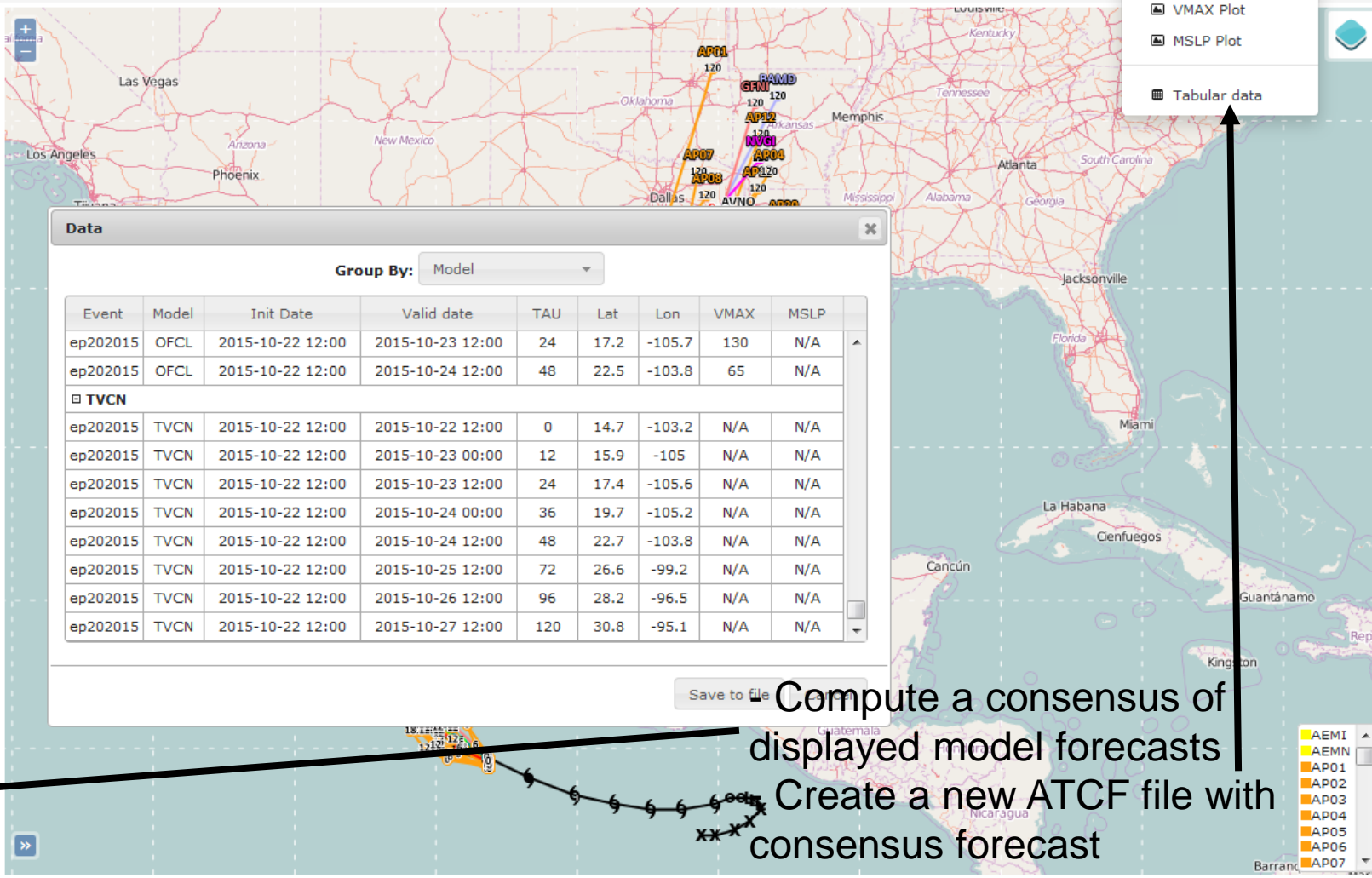
Color by

- Model
- Init date
- Intensity

Consensus

Display

View tracks



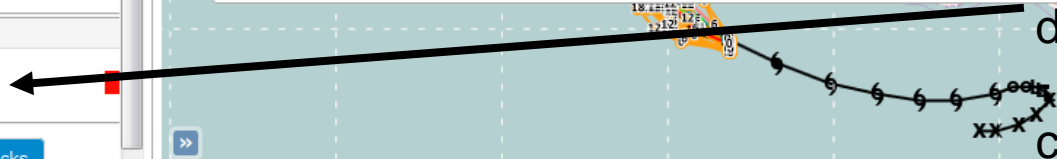
- VMAX Plot
- MSLP Plot
- Tabular data

Data

Group By: Model

Event	Model	Init Date	Valid date	TAU	Lat	Lon	VMAX	MSLP
ep202015	OFCL	2015-10-22 12:00	2015-10-23 12:00	24	17.2	-105.7	130	N/A
ep202015	OFCL	2015-10-22 12:00	2015-10-24 12:00	48	22.5	-103.8	65	N/A
<b>TVCN</b>								
ep202015	TVCN	2015-10-22 12:00	2015-10-22 12:00	0	14.7	-103.2	N/A	N/A
ep202015	TVCN	2015-10-22 12:00	2015-10-23 00:00	12	15.9	-105	N/A	N/A
ep202015	TVCN	2015-10-22 12:00	2015-10-23 12:00	24	17.4	-105.6	N/A	N/A
ep202015	TVCN	2015-10-22 12:00	2015-10-24 00:00	36	19.7	-105.2	N/A	N/A
ep202015	TVCN	2015-10-22 12:00	2015-10-24 12:00	48	22.7	-103.8	N/A	N/A
ep202015	TVCN	2015-10-22 12:00	2015-10-25 12:00	72	26.6	-99.2	N/A	N/A
ep202015	TVCN	2015-10-22 12:00	2015-10-26 12:00	96	28.2	-96.5	N/A	N/A
ep202015	TVCN	2015-10-22 12:00	2015-10-27 12:00	120	30.8	-95.1	N/A	N/A

Compute a consensus of displayed model forecasts  
 Create a new ATCF file with consensus forecast



# Time Series Plotting

http://www.hfip.org/nhc-display/#

Search



NHC-display

Guidance 2015 EP ep202015 PATRICIA

View Tools

View tracks

Best track date/time

List Period  
All dates selected.

Group by: day hour

Models init date/time

List Period  
[2015-10-22: 12:00]

Group by: day hour

Groups/Models

21 of 230 selected  
No individual models sele...

TAU

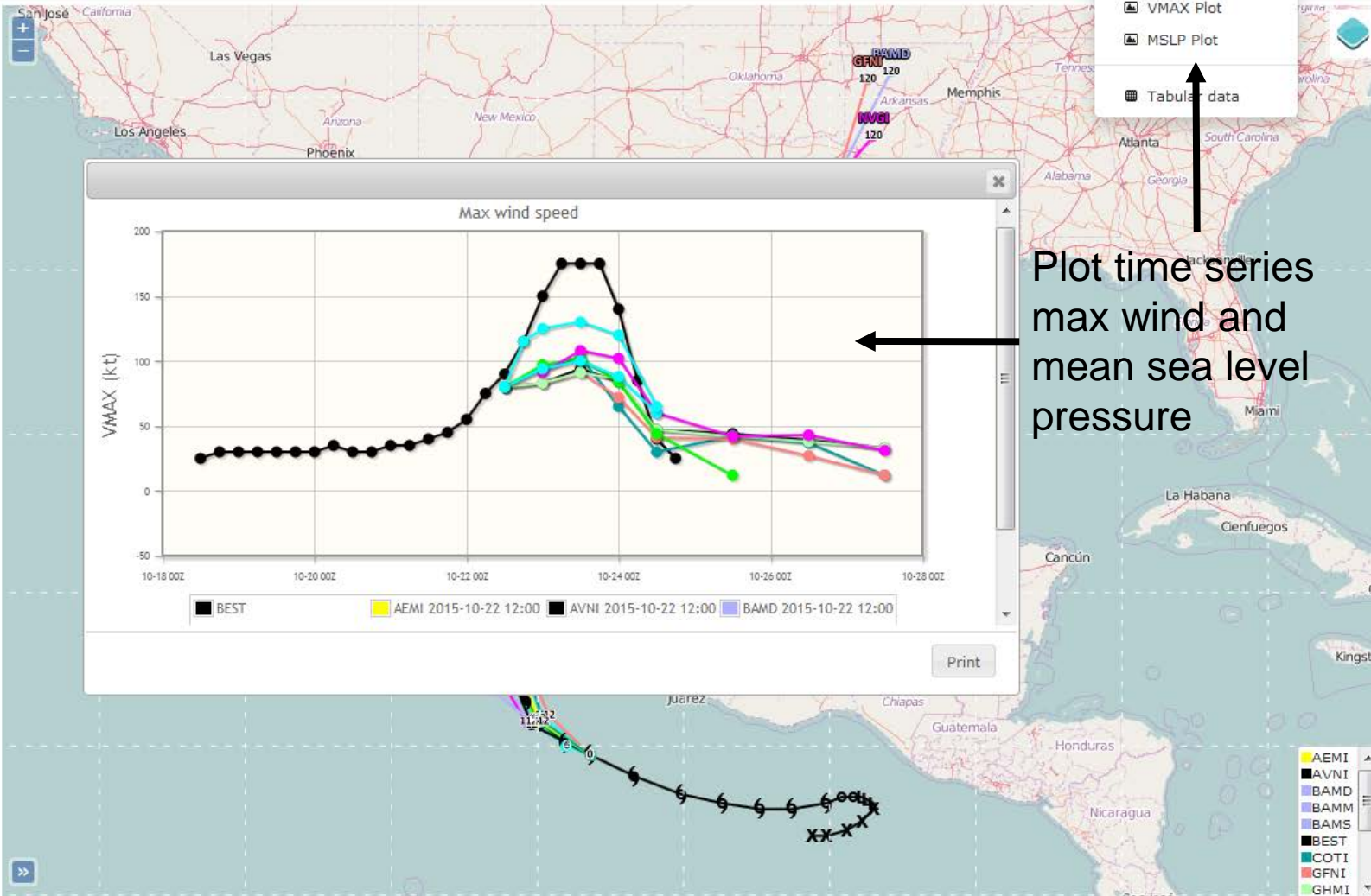
List Period  
All selected

Color by

Model  
Init date  
Intensity

Consensus

Display



Plot time series max wind and mean sea level pressure

- AEMI
- AVNI
- BAMD
- BAMM
- BAMS
- BEST
- COTI
- GFNI
- GHMI

# Save and Print Capabilities

http://www.hfip.org/nhc-display/#

NHC-display

Guidance 2015 EP ep202015 PATRICIA

View Tools

Save map  
Print map  
Show/Hide legend

Best track date/time  
List Period  
All dates selected.  
Group by: day hour

Models init date/time  
List Period  
[2015-10-22: 12:00]  
Group by: day hour

Groups/Models  
All model groups selected.  
No individual models sele...

TAU  
List Period  
All selected

Color by  
Model  
Init date  
Intensity

Consensus  
Display

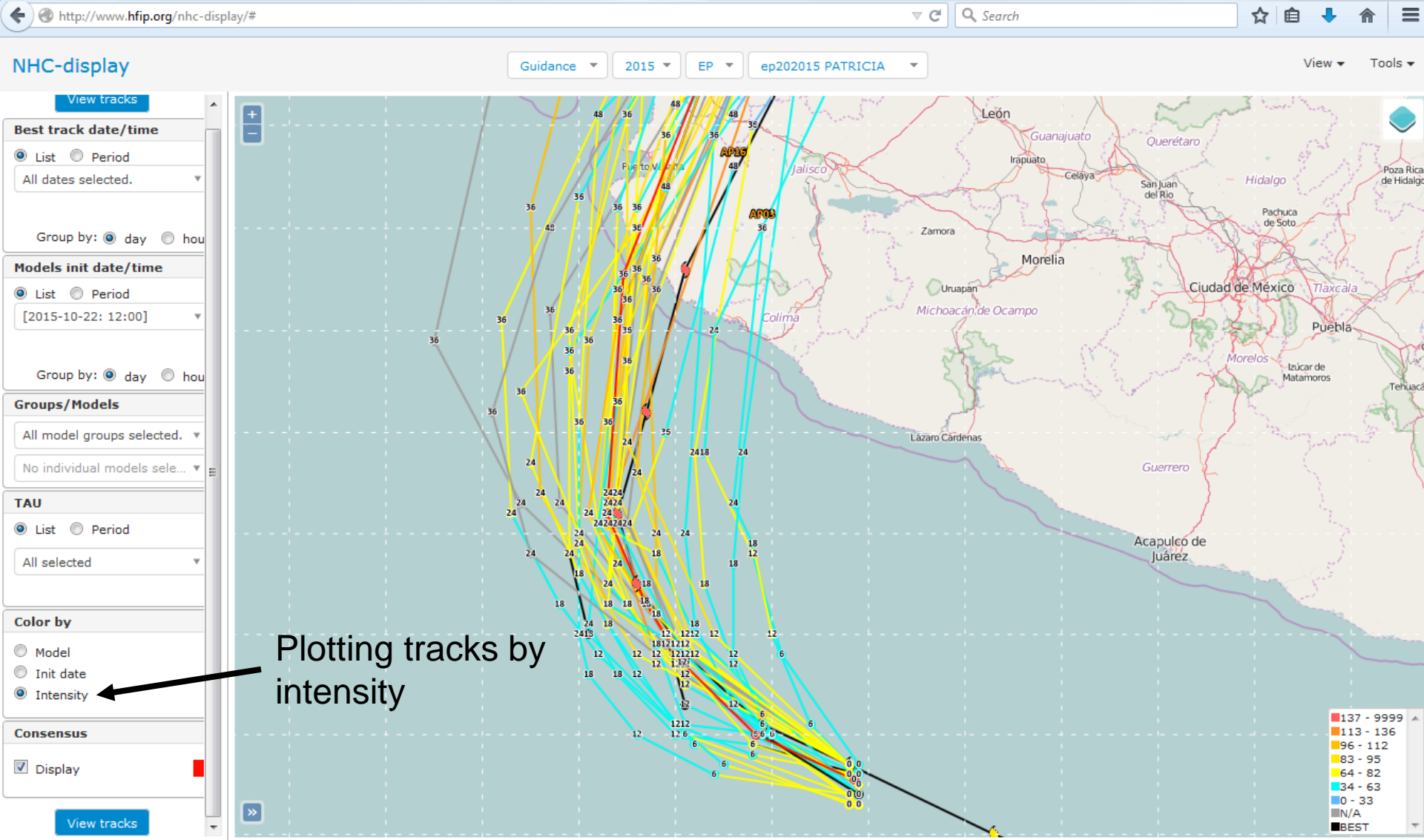
Right Click on image to Save Image As...

Save and printing maps for other applications

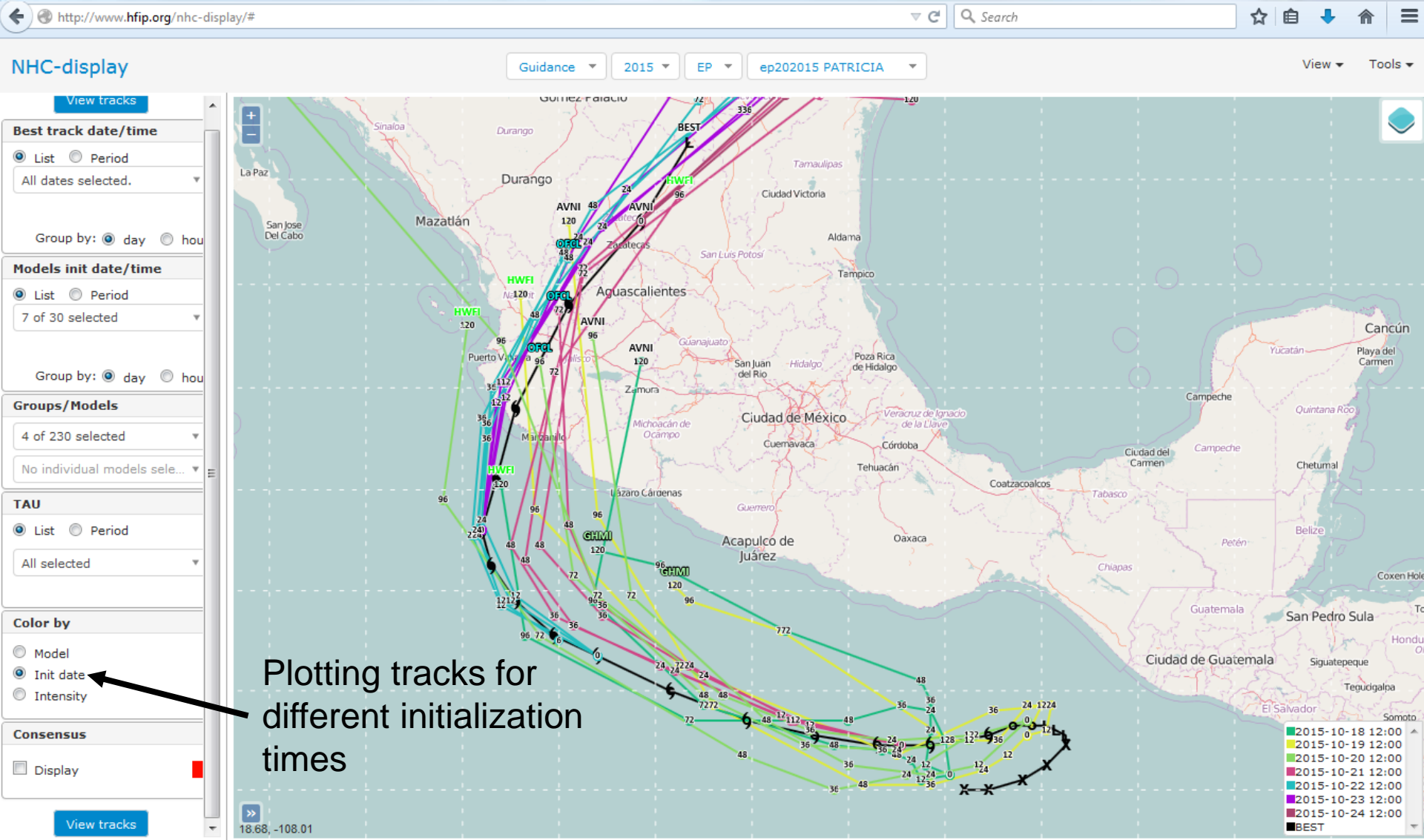
The screenshot displays the NHC-display web application interface. At the top, the browser address bar shows the URL 'http://www.hfip.org/nhc-display/#'. The application header includes the title 'NHC-display' and navigation options for 'Guidance', '2015', 'EP', and 'ep202015 PATRICIA'. A 'View Tools' menu is open, showing 'Save map', 'Print map', and 'Show/Hide legend'. The main map area shows a geographical view of the Americas with several hurricane tracks overlaid, labeled with model names and dates such as 'AP01 120', 'AP02 120', 'AP03 120', 'AP04 120', 'AP05 120', 'AP06 120', and 'AP07 120'. A context menu is open over the map, and a text overlay 'Save and printing maps for other applications' with arrows points to the 'Save map' and 'Print map' options. The left sidebar contains various filters and controls, including 'Best track date/time', 'Models init date/time', 'Groups/Models', 'TAU', 'Color by', and 'Consensus'. A legend on the right side of the map lists model names and their corresponding colors.



# Diagnostic Evaluation - Intensity



# Diagnostic Evaluation – Init Time



# Selectable Background Maps

**View tracks**

**Best track date/time**

List  Period

All dates selected.

Group by:  day  hour

**Models init date/time**

List  Period

[2015-10-22: 12:00]

Group by:  day  hour

**Groups/Models**

21 of 230 selected

No individual models selected

**TAU**

List  Period

All selected

**Color by**

Model

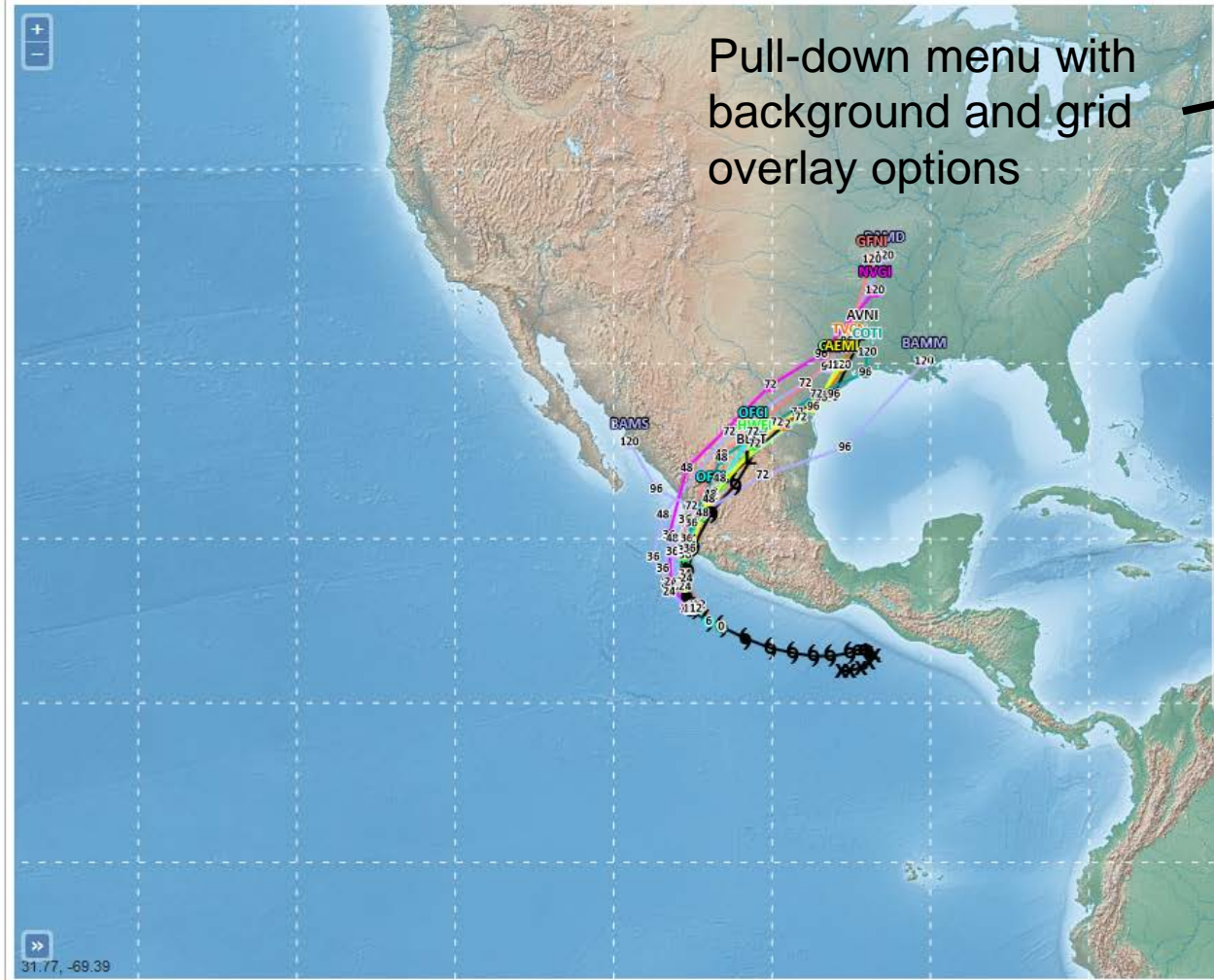
Init date

Intensity

**Consensus**

Display

**View tracks**



Pull-down menu with background and grid overlay options

**Gridded fields**

- None
- Surface temp
- Wind @ 850hPa
- Relative humidity @ 700hPa
- Sea Surface Temp

**Gridded fields - overlays**

- Wind @ 850hPa

**Base maps**

- Bright
- Natural Earth
- Stamen-lite
- OSM

**October 2015**

Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

**Legend**

- AEMI
- AVNI
- BAMD
- BAMS
- BAMS
- BEST
- COTI
- GFNI
- GMHI

# Current Gridded Product: Daily SST

http://www.hfip.org/nhc-display/#

NHC-display

Guidance 2015 EP ep202015 PATRICIA

View Tools

View tracks

**Best track date/time**

List  Period

All dates selected.

Group by:  day  hou

**Models init date/time**

List  Period

[2015-10-22: 12:00]

Group by:  day  hou

**Groups/Models**

21 of 230 selected

No individual models sele...

**TAU**

List  Period

All selected

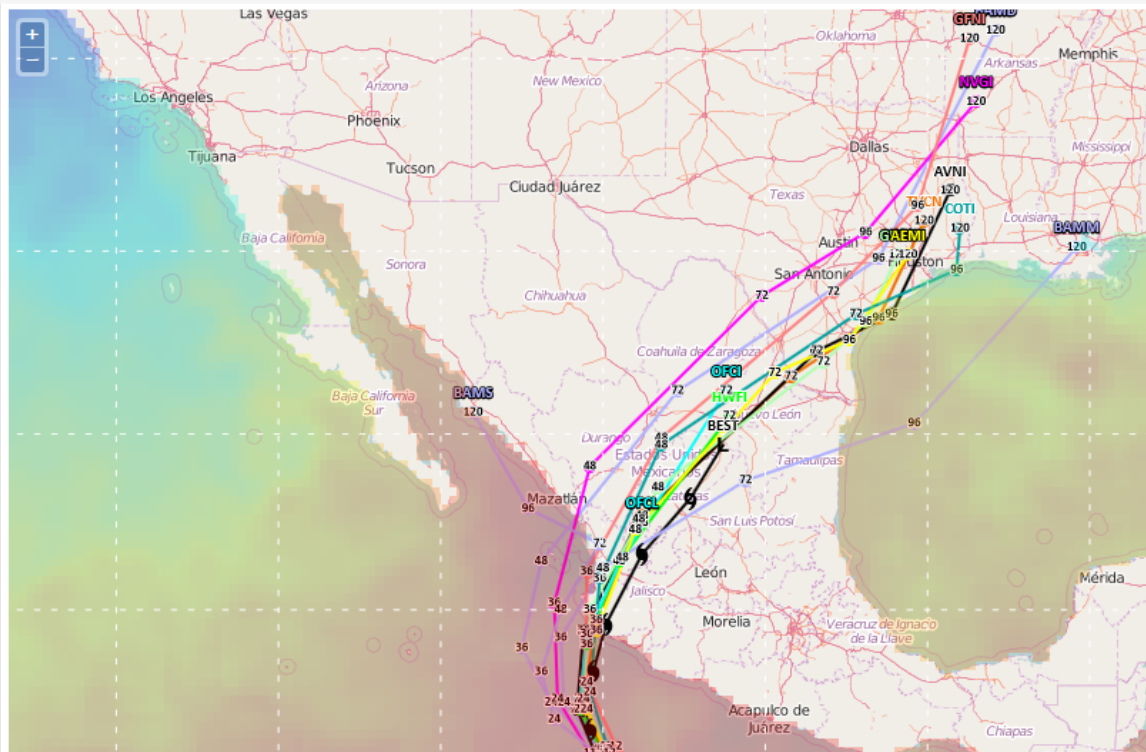
**Color by**

Model  
 Init date  
 Intensity

**Consensus**

Display

View tracks



**Gridded fields**

- None
- Surface temp
- Wind @ 850hPa
- Relative humidity @ 700hPa
- Sea Surface Temp

**Gridded fields - overlays**

- Wind @ 850hPa

**Base maps**

- Bright
- Natural Earth
- Stamen-lite
- OSM

**Sea Surface Temp(C)** Min: 22 Max: 32

October 2015

Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Color scale: 19.25, 23.5, 27.75, 32

- $1/4^\circ$  daily Optimum Interpolation Sea Surface Temperature (OISST):
- <https://www.ncdc.noaa.gov/oisst/data-access>
- The product uses infrared satellite data from the Advanced Very High Resolution Radiometer (AVHRR) to estimate global SST

Legend for tracks:

- AEMI
- AVNI
- BAMD
- BAMS
- BMM
- COTI
- GFNI
- GMI

# Ongoing Development - Gridded Forecast and Satellite Products

**View tracks**

**Best track date/time**  
 List  Period  
All dates selected.

Group by:  day  hou

**Models init date/time**  
 List  Period  
[2015-10-22: 12:00]

Group by:  day  hou

**Groups/Models**  
21 of 230 selected  
No individual models sele...

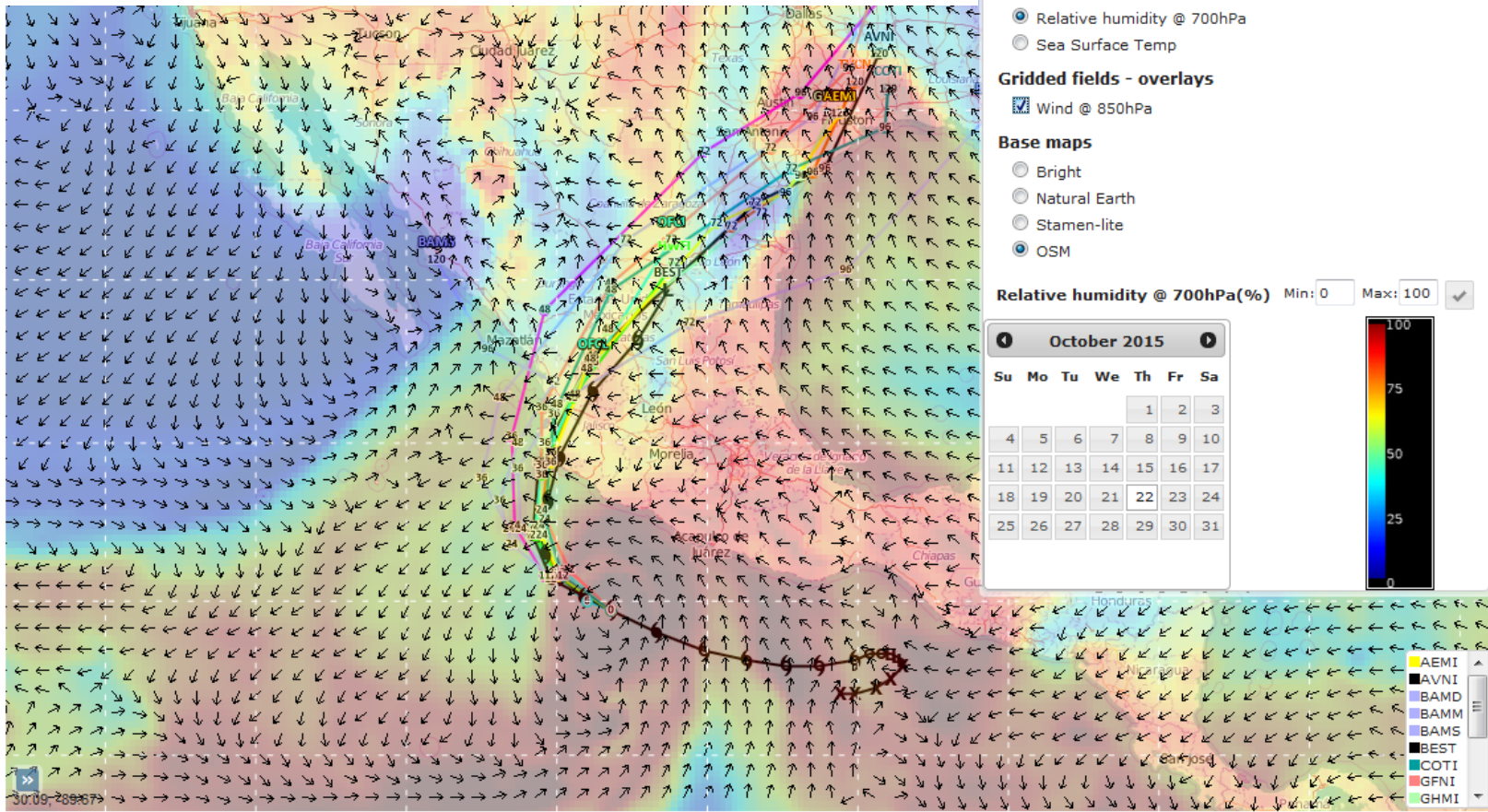
**TAU**  
 List  Period  
All selected

**Color by**  
 Model  
 Init date  
 Intensity

**Consensus**  
 Display

**View tracks**

-Example of gridded fields of 700 hPa RH and 850 hPa wind fields from HWRP



# Summary

- **HFIP Website Support**

- HFIP website development
- HFIP software and systems support
- HFIP Project Office support – group email lists and workshop coordination

- **HFIP Database Development**

- Provides access to HFIP Tier1 and Diagnostic datasets
- Available to the community <https://verif.rap.ucar.edu/repository>

- **HFIP Display and Diagnostic System**

- Modular and adaptable web-based display framework
- Available to the community: <http://www.hfip.org/nhc-display>
- Provide a “live” demonstration of capabilities