

Illustrative Visualization of Hurricane Advisory Information

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Motivation

The National Oceanic and Atmospheric Administration (NOAA) National Hurricane Center's (NHC) Tropical Cyclone Advisories contain several heterogeneous data types that are difficult to encode in a single image.

Objective

To develop new illustrative visualizations of NHC Advisories using a single, comprehensible image that conveys past and present information for tropical storm(s).

NOAA NHC Advisories

- ◊ The NHC currently offers some advisory information in separate color images.
- ◊ Advisory contains tidal information and forecast of storm positions, intensities, and wind fields.
- ◊ Focus of the current work is on the wind quadrant radii (wind swaths).
- ◊ Advisories contain the wind swaths for tropical storm force winds (34 knots), storm force winds (50 knots), and hurricane force winds (64 knots).

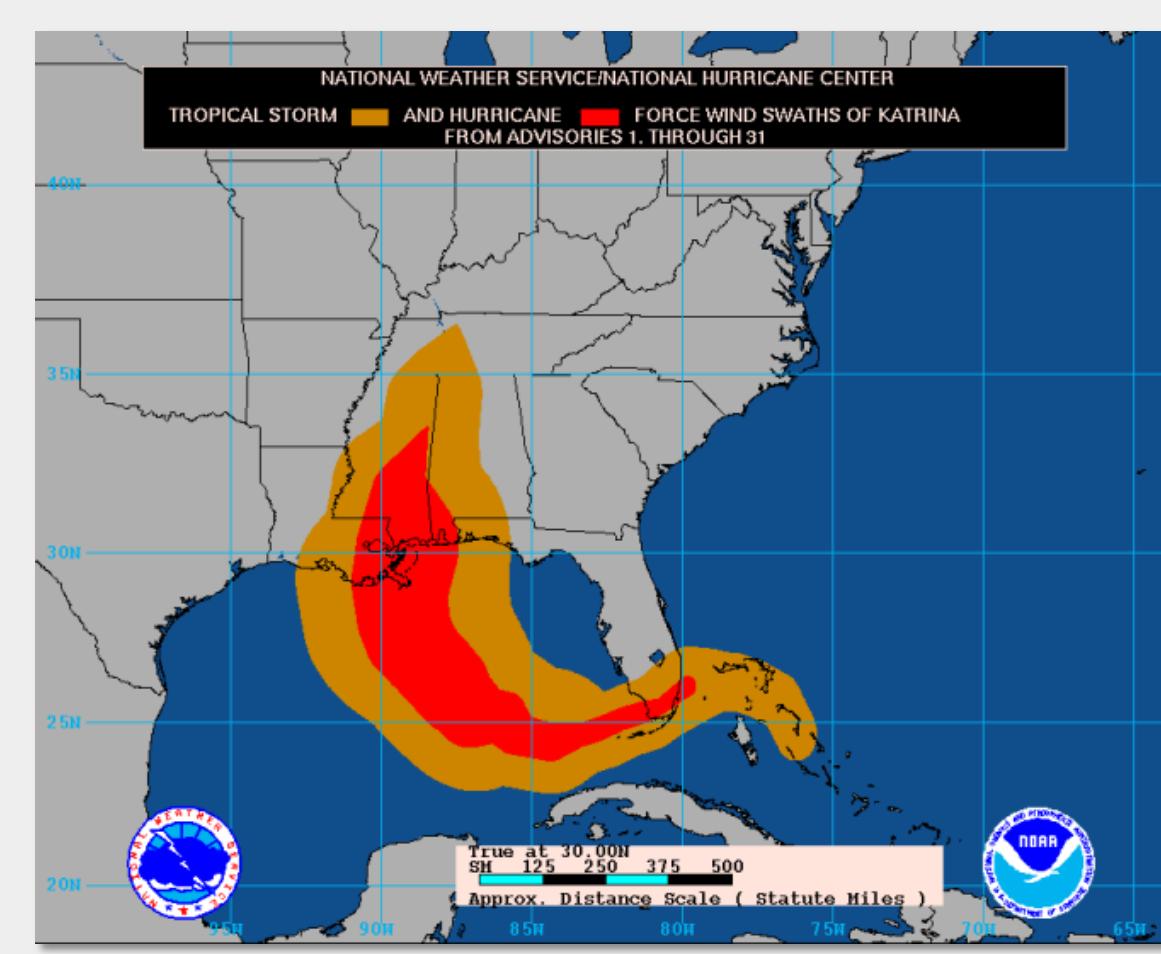


Image courtesy NOAA NHC

XXCC MEATWAD ALL
TIAAO KINE DINE ALL
HURRICANE KATRINA FORECAST/ADVISORY NUMBER: 10
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL AL112005
2100Z SAT AUG 27 2005

AT 4 PM CDT...2100Z...THE HURRICANE WATCH IS EXTENDED WESTWARD TO INTRACOASTAL CITY LOUISIANA AND EASTWARD TO THE FLORIDA-ALABAMA BORDER. THE HURRICANE WATCH IS ALSO EXTENDED SOUTH ALONG THE SOUTHERN GULF COAST FROM INTRACOASTAL CITY TO THE ALABAMA-FLORIDA BORDER.

A HURRICANE WARNING WILL LIKELY BE REQUIRED FOR PORTIONS OF THE NORTHERN GULF COAST LATER TONIGHT OR SUNDAY. INTERESTS IN THIS AREA SHOULD MONITOR THE PROGRESS OF KATRINA.

AT 5 PM EDT...2100Z...THE TROPICAL STORM WARNING IS DISCONTINUED FOR THE FLORIDA KEYS.

HURRICANE CENTER LOCATED NEAR 24.6N 85.6W AT 27/2100Z
POSITION ACCURATE WITHIN 10 NM

PRESENT MOVEMENT TOWARD THE WEST OR 275 DEGREES AT 6 KT

ESTIMATED MINIMUM CENTRAL PRESSURE 945 MB
EYE DIAMETER 45 MM
MAX SUSTAINED WINDS 100 KT WITH GUSTS TO 120 KT.
44 KT...60NE 60SW 60NW 60SE
50 KT.....60NE 60SE 60SW 60NW
34 KT....140NE 90SE 90SW 130NW
13 KT...140NE 140SE 140SW 140NW

WINDS AND SEAS VARY GREATLY IN EACH QUADRANT. RADII IN NAUTICAL MILES ARE THE LARGEST RADII EXPECTED ANYWHERE IN THAT QUADRANT.

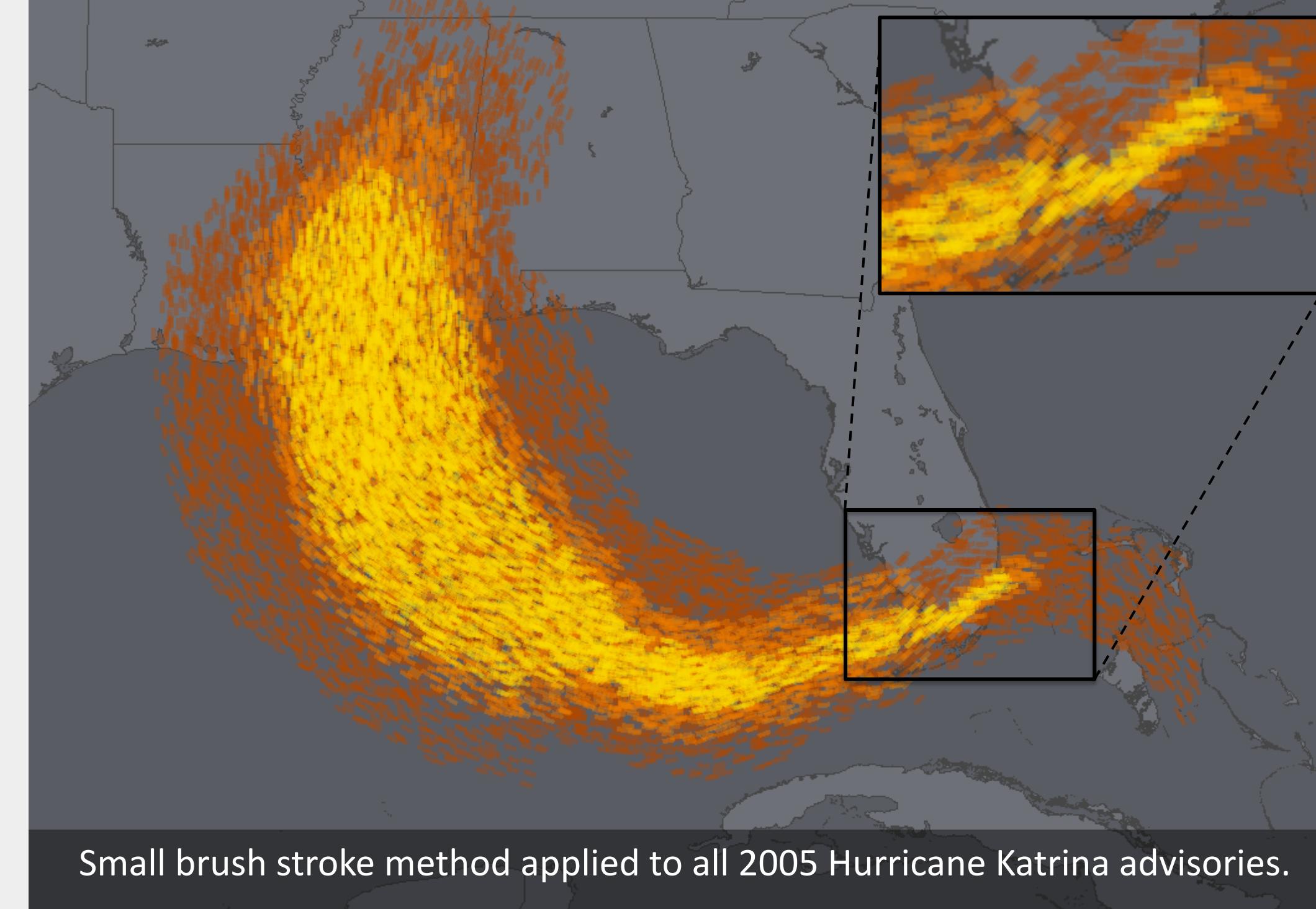
REPEAT...CENTER LOCATED NEAR 24.6N 85.6W AT 27/2100Z
AT 27/1800Z CENTER WAS LOCATED NEAR 24.5N 85.3W

FORECAST VALID 28/0600Z 24.9N 86.8W
MAX WIND 105 KT., GUSTS 130 KT.
44 KT...60NE 60SW 60NW 60SE
50 KT.....60NE 60SE 60SW 60NW
34 KT....140NE 90SE 90SW 130NW.

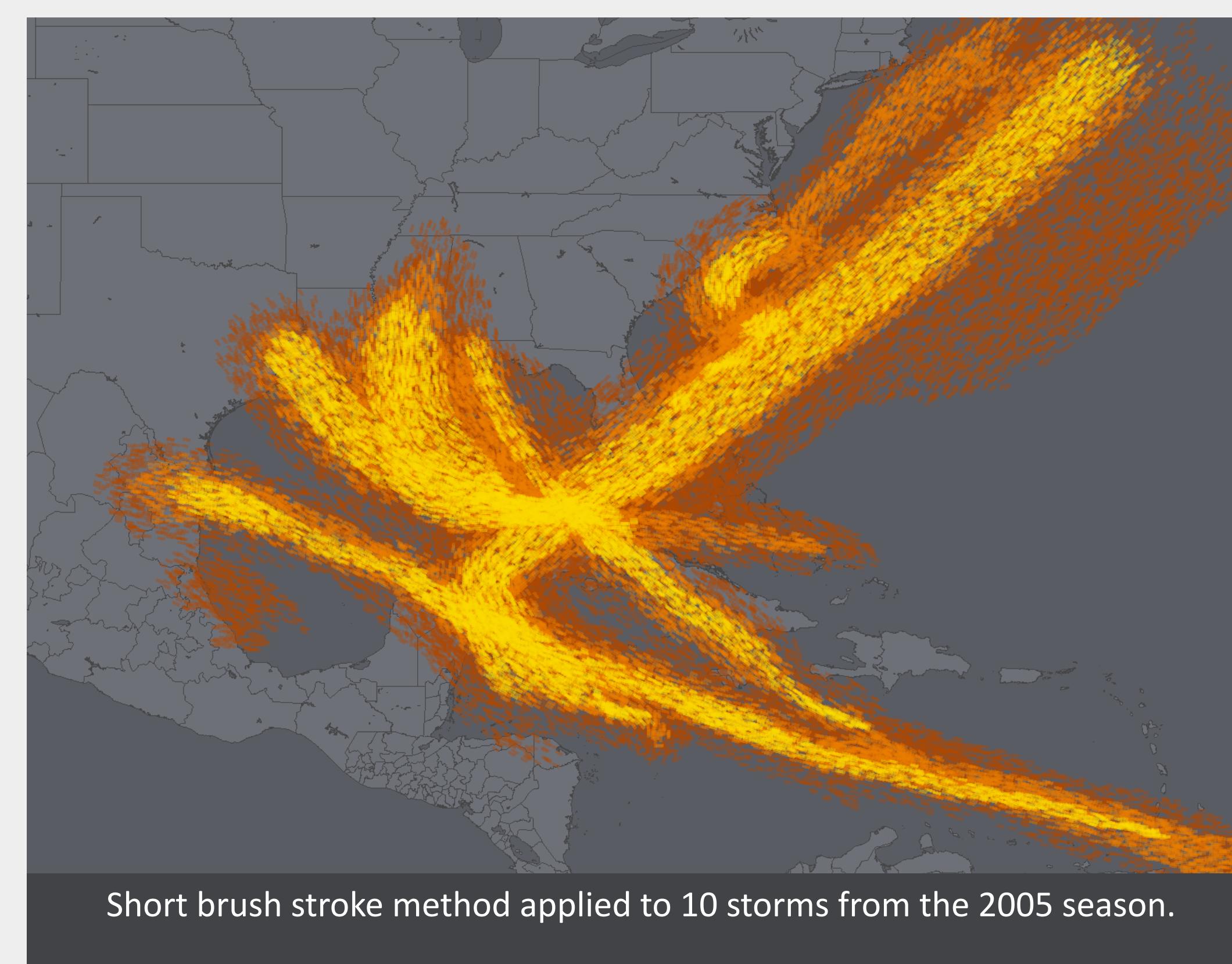
FORECAST VALID 29/1800Z 25.8N 88.8W
MAX WIND 115 KT., GUSTS 140 KT.
44 KT...60NE 60SW 60NW 60SE
50 KT.....60NE 60SE 60SW 60NW
34 KT....140NE 100SE 100SW 140NW.

FORECAST VALID 29/0600Z 27.5N 89.6W
MAX WIND 115 KT., GUSTS 145 KT.
44 KT...60NE 60SW 60NW 60SE
50 KT.....60NE 60SE 60SW 60NW
34 KT....140NE 100SE 100SW 140NW.

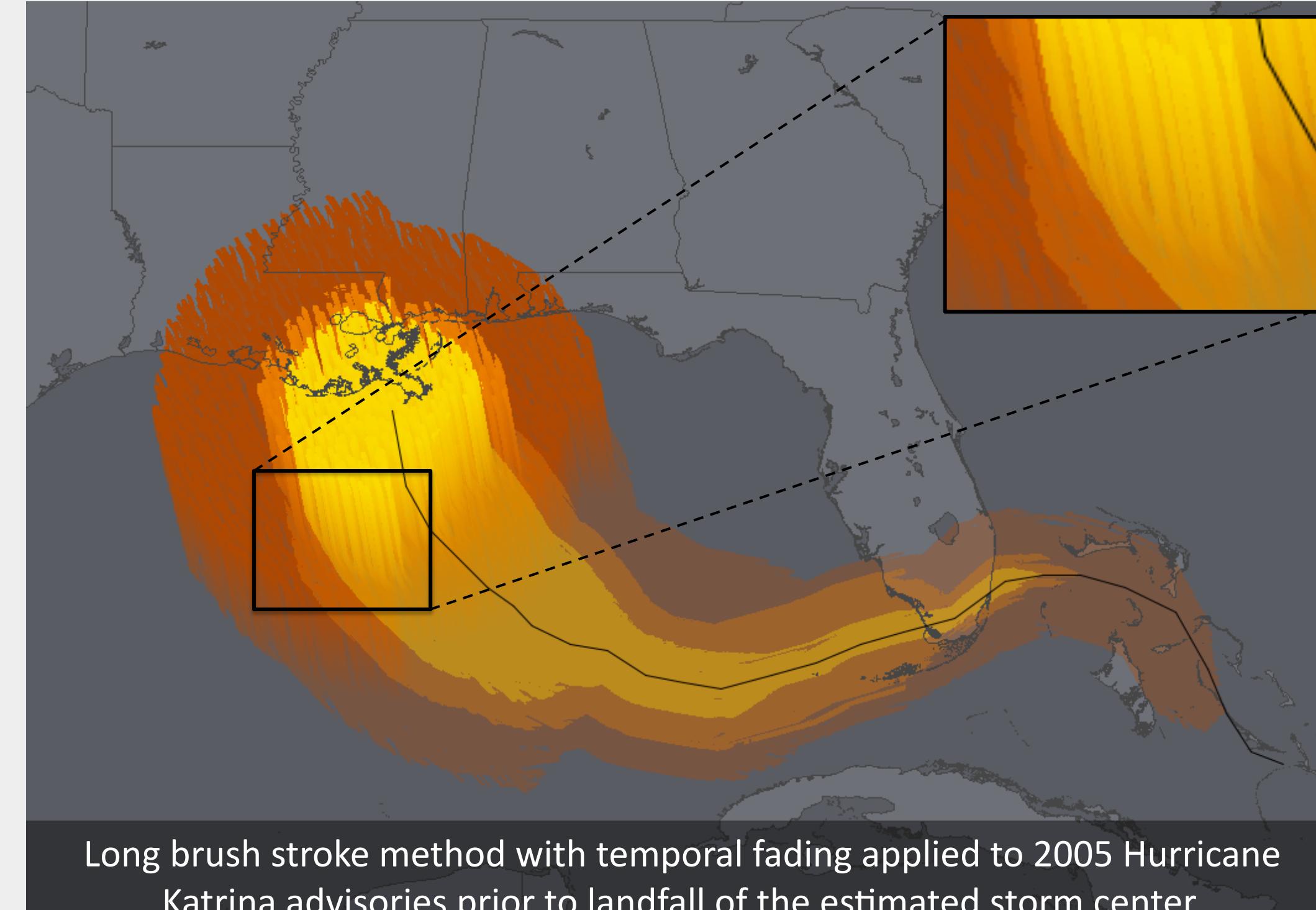
Case Study: Illustrative Visualization of 2005 Hurricane Season Advisories



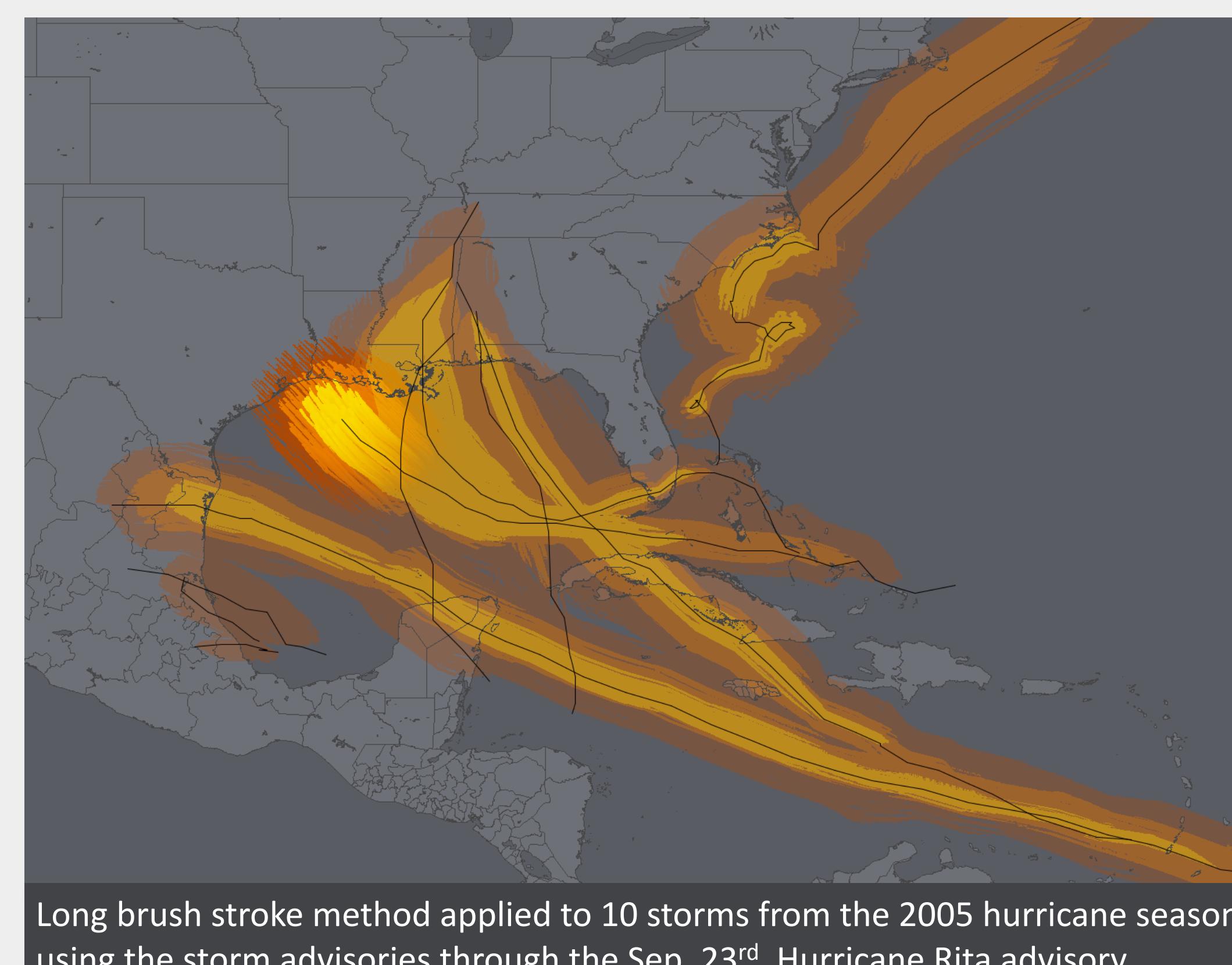
Small brush stroke method applied to all 2005 Hurricane Katrina advisories.



Short brush stroke method applied to 10 storms from the 2005 season.



Long brush stroke method with temporal fading applied to 2005 Hurricane Katrina advisories prior to landfall of the estimated storm center.



Long brush stroke method applied to 10 storms from the 2005 hurricane season using the storm advisories through Sep. 23rd Hurricane Rita advisory.

Storm Track Drawing

FORECAST VALID 28/0600Z 24.9N 86.8W
MAX WIND 105 KT., GUSTS 130 KT.
44 KT...60NE 60SW 60NW
50 KT.....60NE 60SE 60SW 60NW
34 KT....140NE 90SE 90SW 130NW.

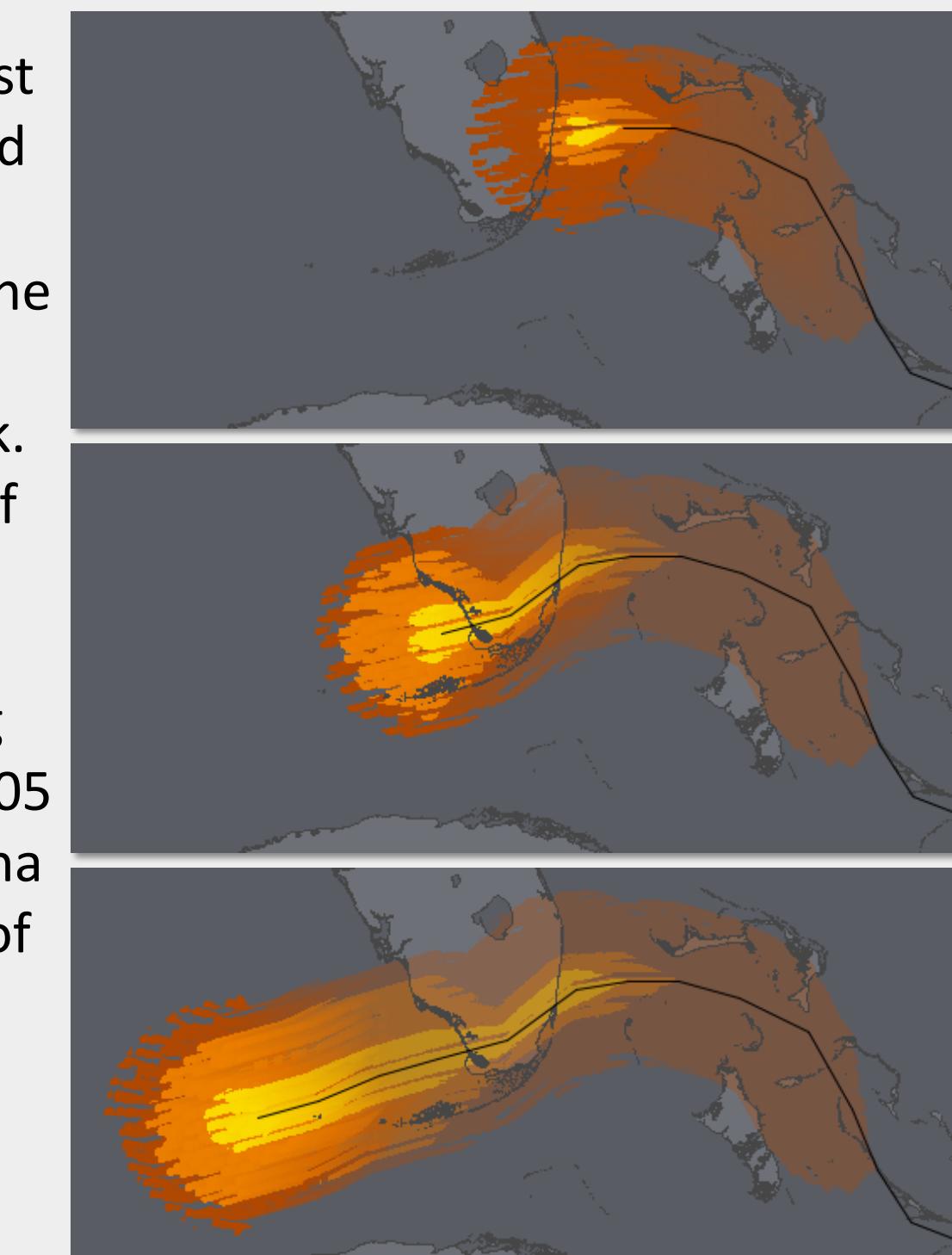
FORECAST VALID 28/1800Z 25.8N 88.3W
MAX WIND 115 KT., GUSTS 140 KT.

Construction polygons for each advisory's 34, 50, and 64 knot wind swath information.



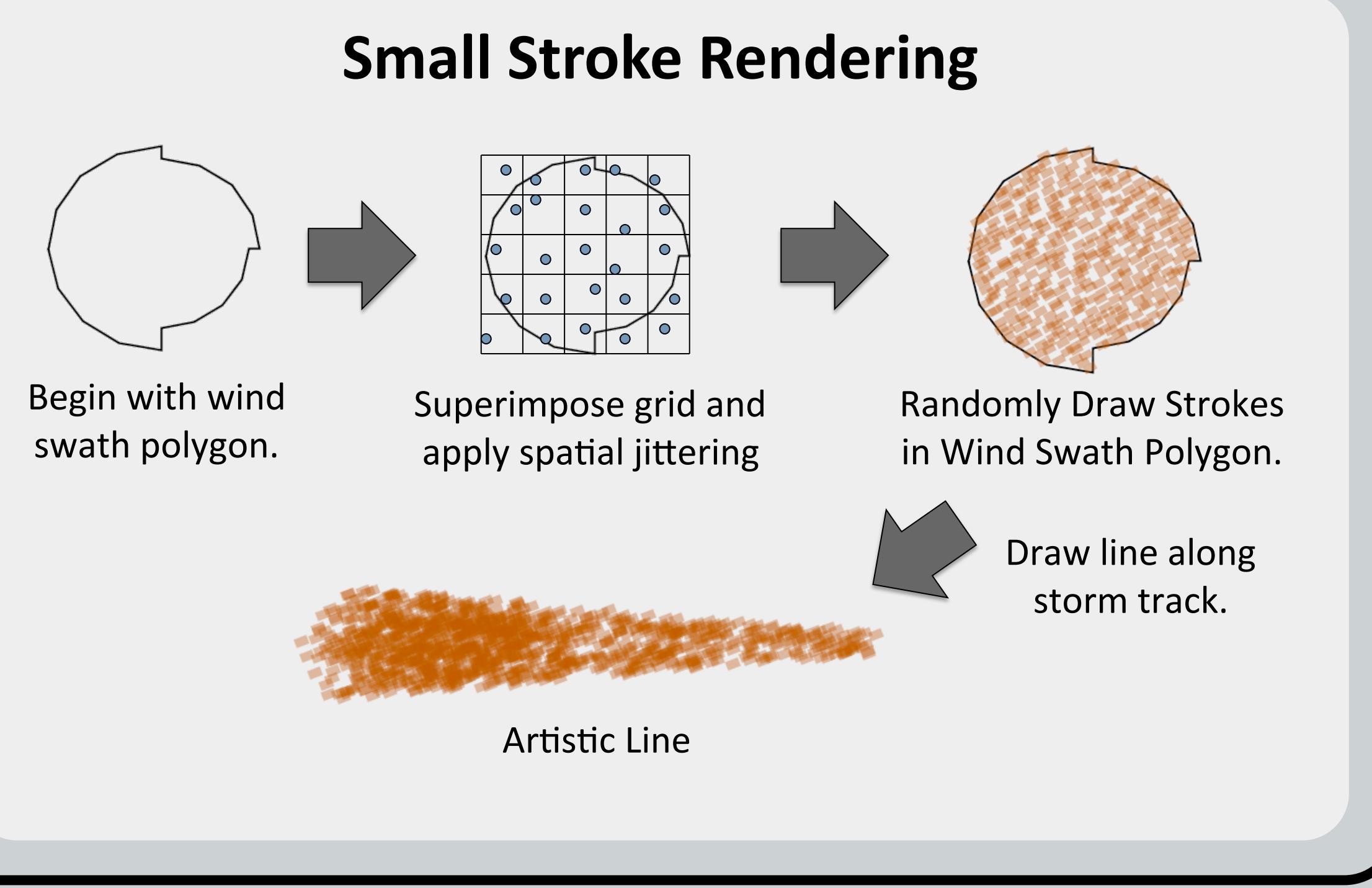
Fill strokes with one of two rendering methods, morphing polygons between advisories as algorithm progresses chronologically.

Last Advisory
Current Advisory

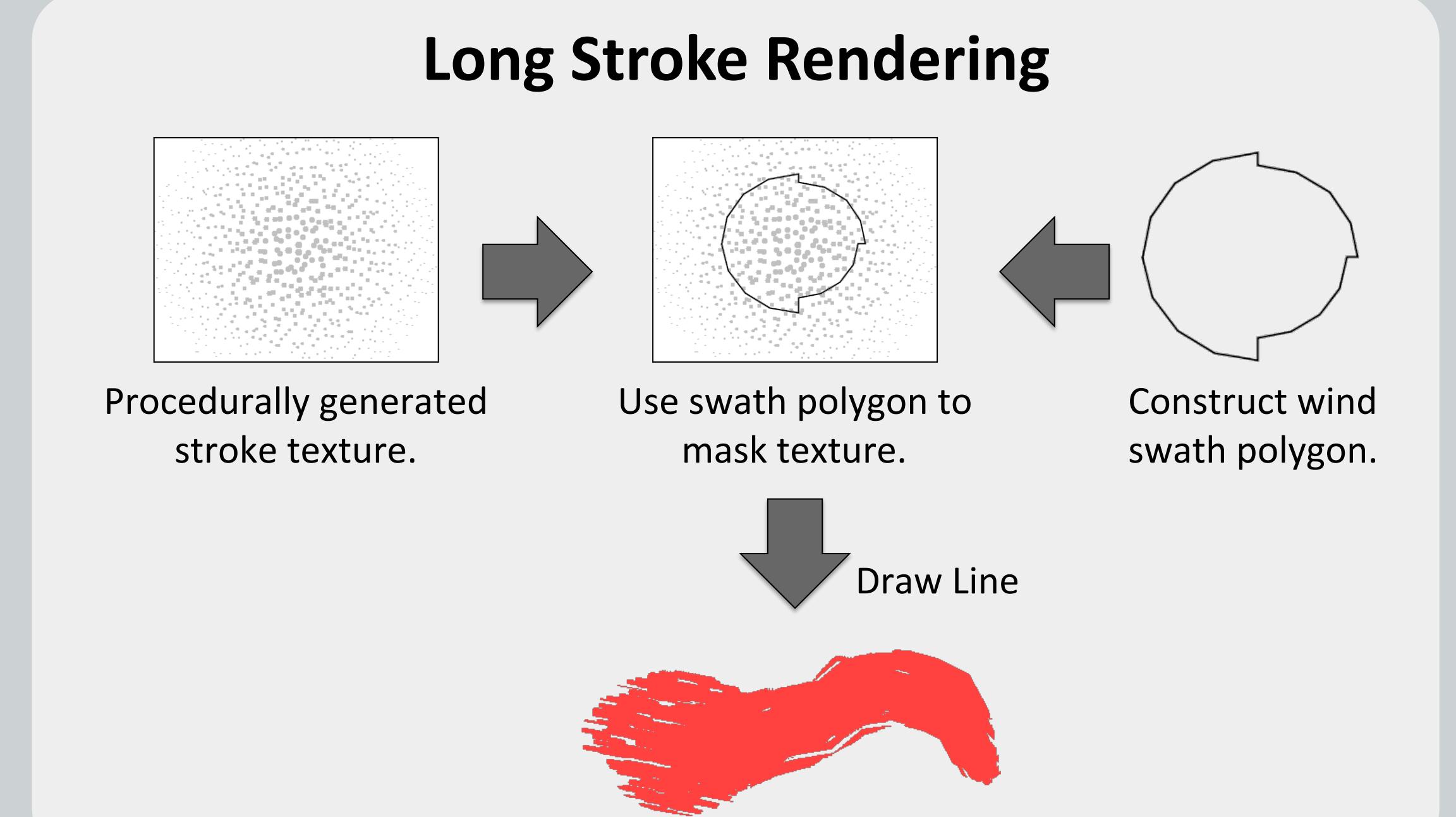


Temporal Stroke Fading

Emphasizes most recently affected regions, while also providing the context of the past storm track. The sequence of figures at right show the temporal fading effect as the 2005 Hurricane Katrina crosses the tip of Florida.



Small Stroke Rendering



Long Stroke Rendering

References

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- M. Kirby, H. Marmanis, and D. H. Laidlaw. Visualizing multivalued data from 2D incompressible flows using concepts from painting. In *Proceedings of IEEE Visualization*, pages 333–340, 1999.
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