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# Using Modern Hurricane Wind Data to Supplement Hydrodynamic Hindcast and Futurecast Models

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# Rationale For Using Hindcasts of Hydrodynamic Models

- “Predicting” past events helps validate hydrodynamic  model.
- Hindcasts closer to large uncertainties inherent to futurecasts.
- Can modern wind fields supplement missing historical data?
- Help with futurecasts?

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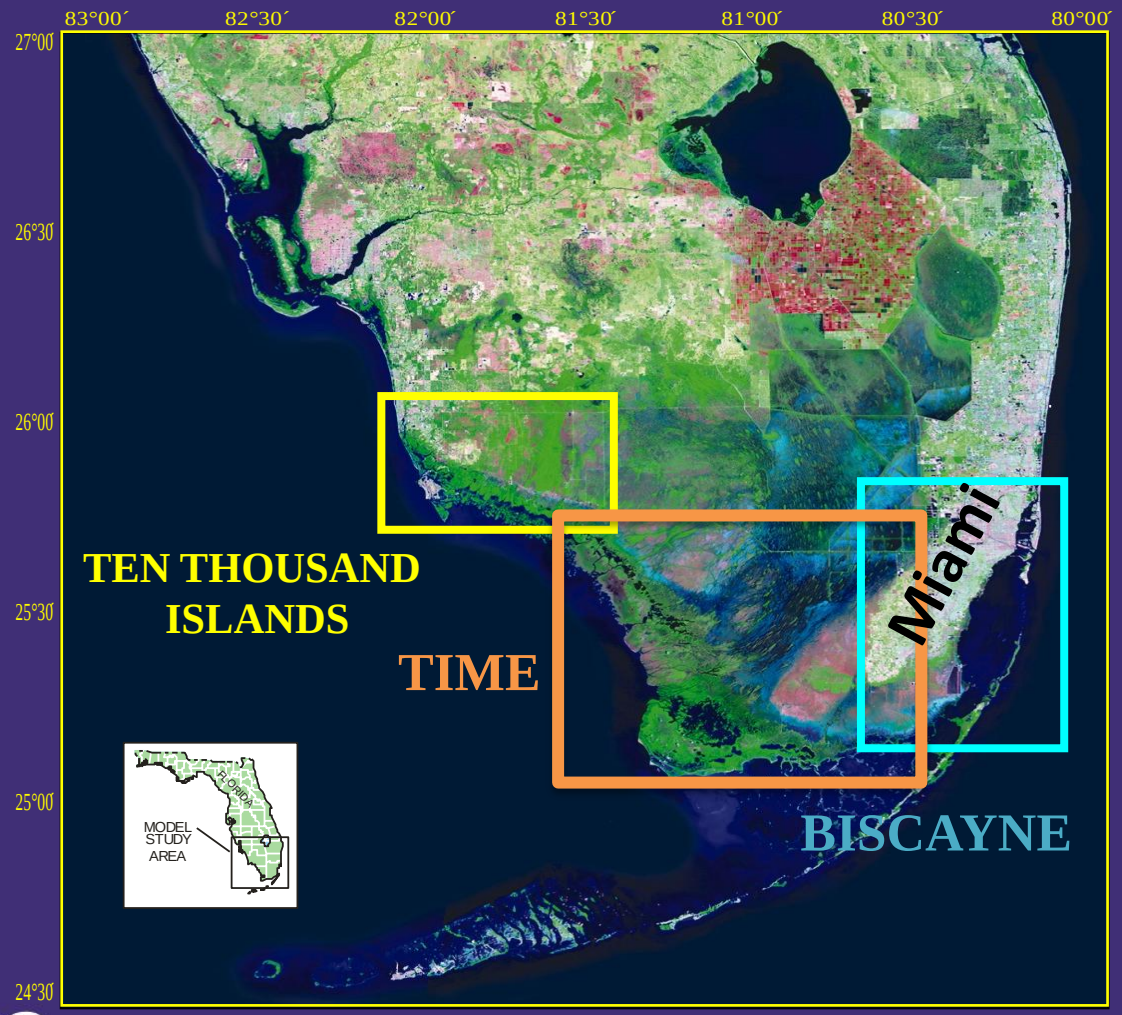
# Hydrodynamic Models in S. Florida




BISCAYNE + TIME = ***BISECT***

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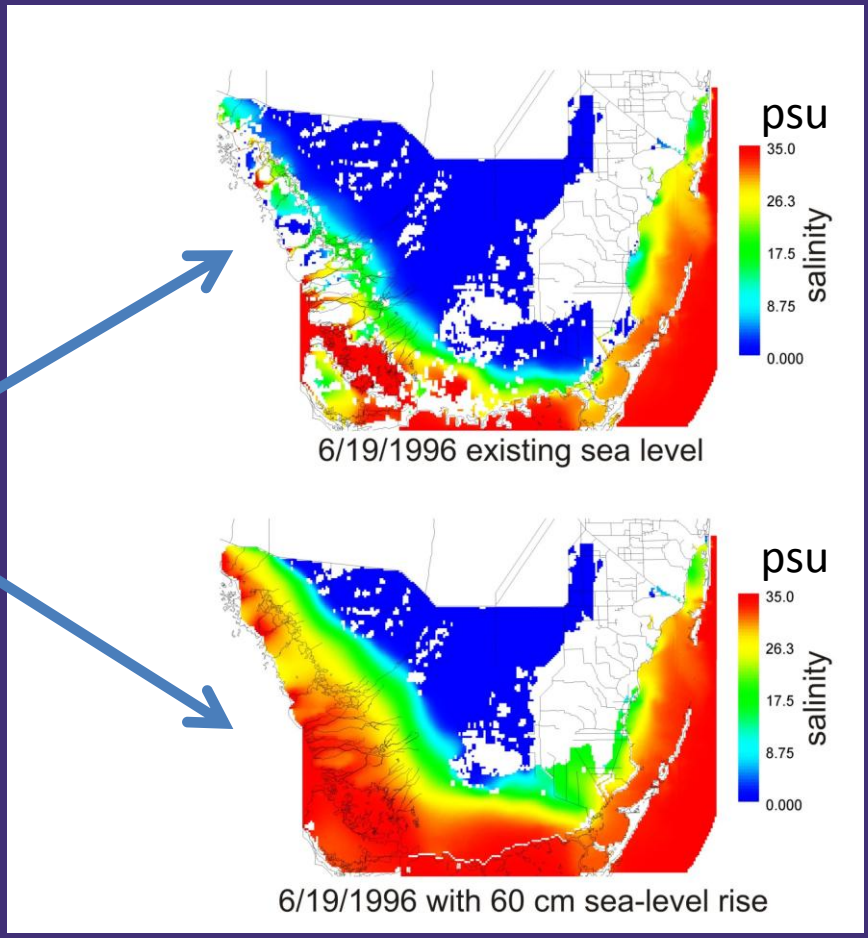
# Hydrodynamic Model Portrays Results in Terms of Salinity and Inundation

BISECT model projection of salinity for 60 cm of Sea-Level Rise

Range 0 – 35 psu
0.5 km x 0.5 km grid cell

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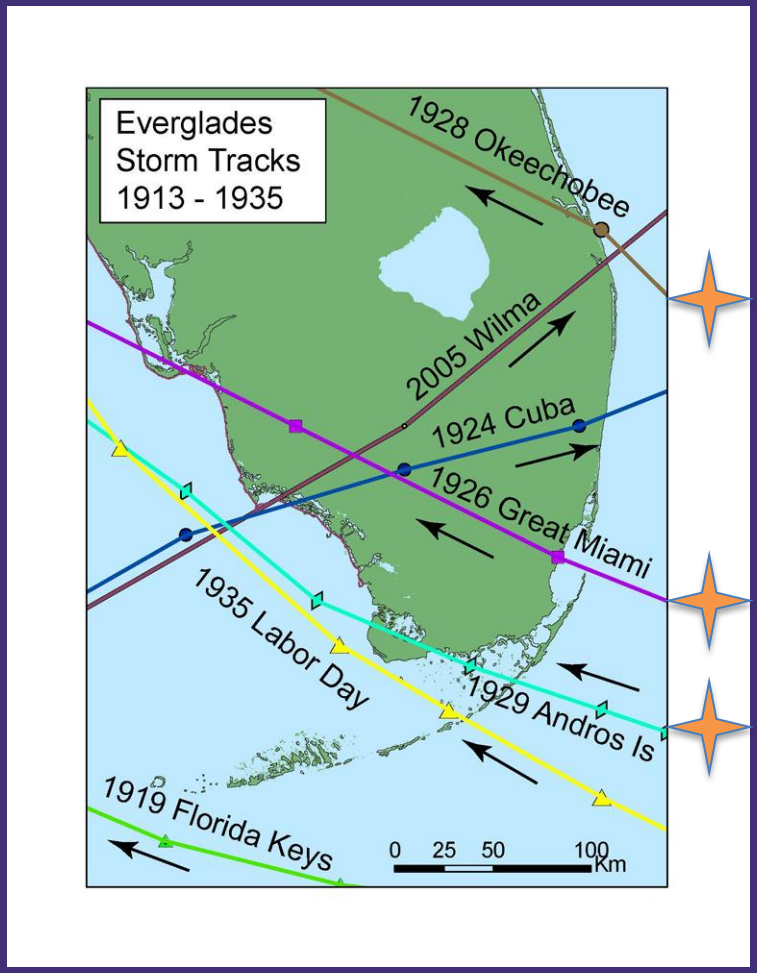
# Historic Storm Tracks




Hurricane Database (HURDAT)

- Every 6 hours
- Wind Speed, Direction, Forward Speed, Pressure?
- Back to 1851

| Name | Year | Date | Wind Knots | Speed Km/hr |
|---|---|---|---|---|
| Great Miami | **1926** | **9/18** | **125** | **18** |
| Okee-chobee | **1928** | **9/17** | **115** | **14** |
| Andros Island | **1929** | **9/28** | **85** | **11** |

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(Landsea et al, 2008; 2012)

# 3 Intervals Chosen for Hindcasts

- **1926 – 1932 "Far-Hindcast"**
  - Data-poor; Chosen to span 1st air photo coverage
- **1934 – 1940**
  - Chosen for air photo coverage and PEST analysis
- **1996 – 2002 "Near – Hindcast"**
  - Data -rich; Used to develop hydrodynamic model

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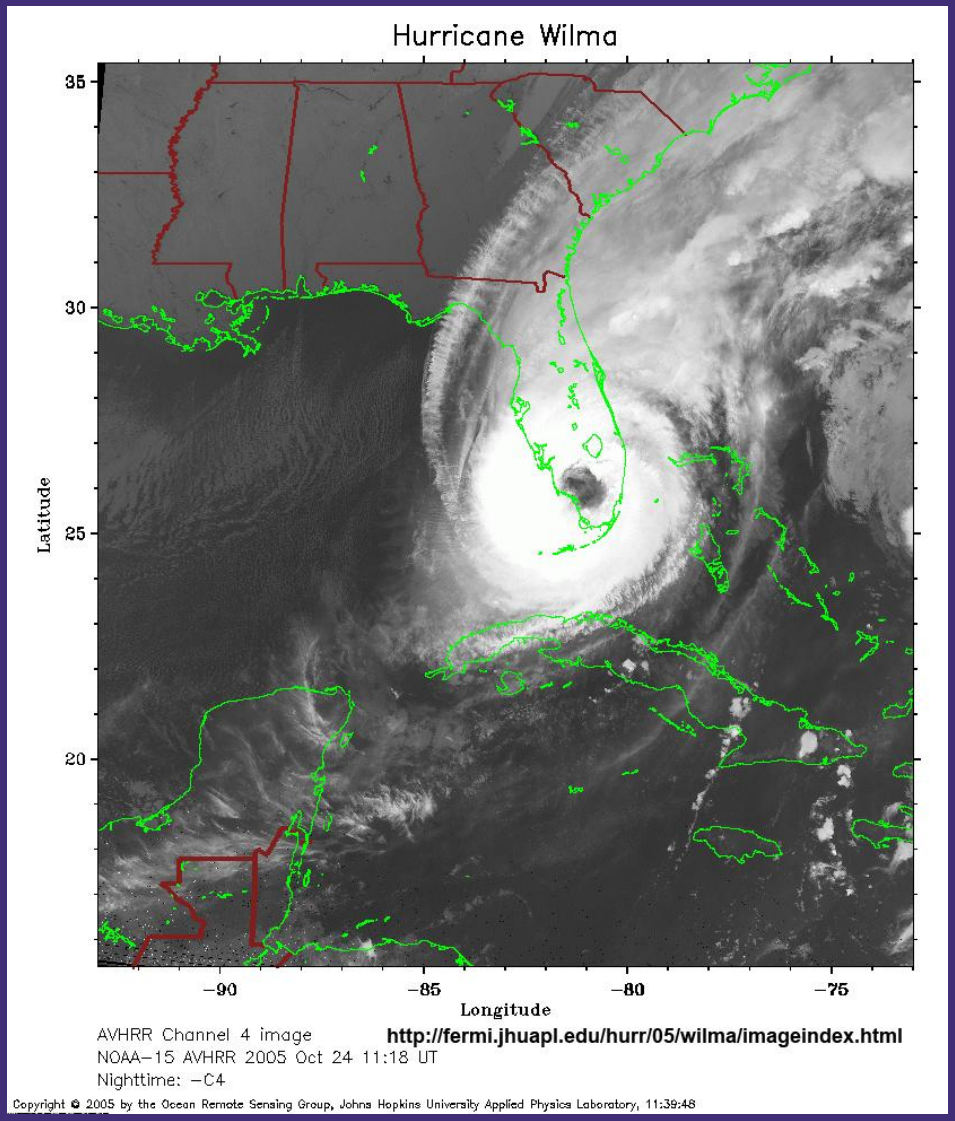


# Objective

**Use wind values of modern storms as estimate for wind variability in hindcast**

***Hurricane Wilma***
***Oct. 24, 2005***
***11:18 GMT***

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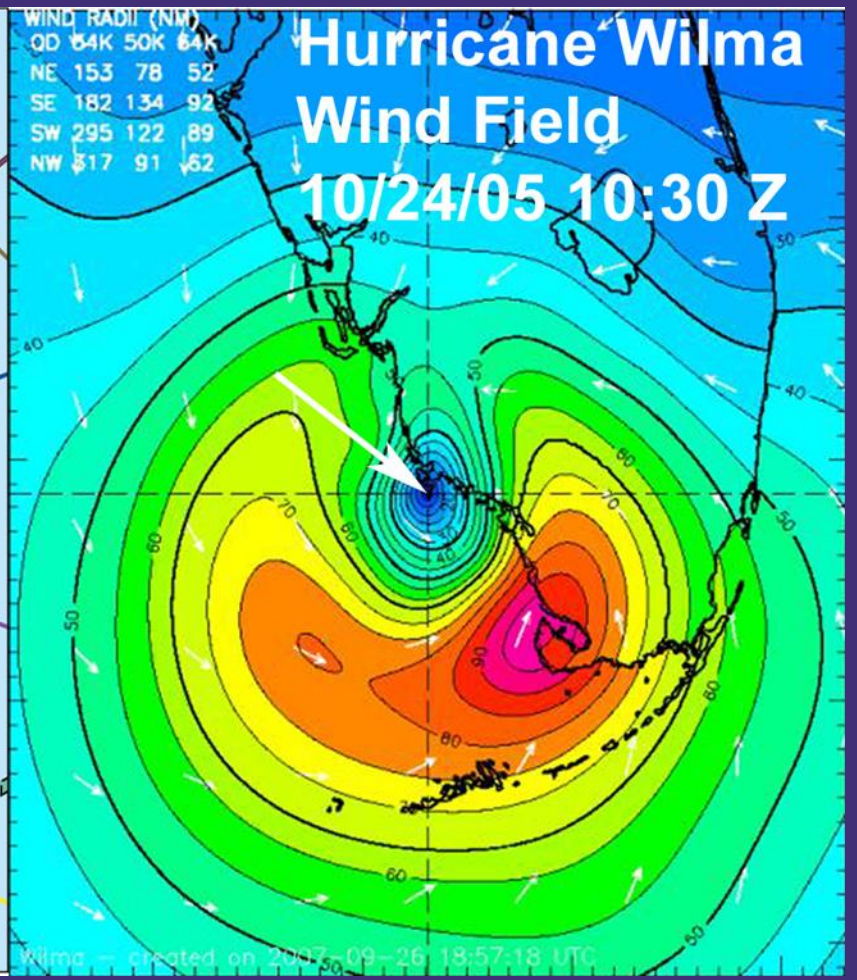
# Gridded Surface Wind Analysis for Hurricane Wilma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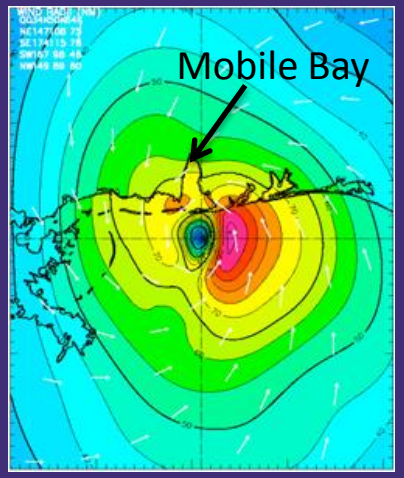
Powell et al, 1988

# Why choose Gridded Surface Wind Analysis Product?


**Hurricane Ivan – 9/16/2004**





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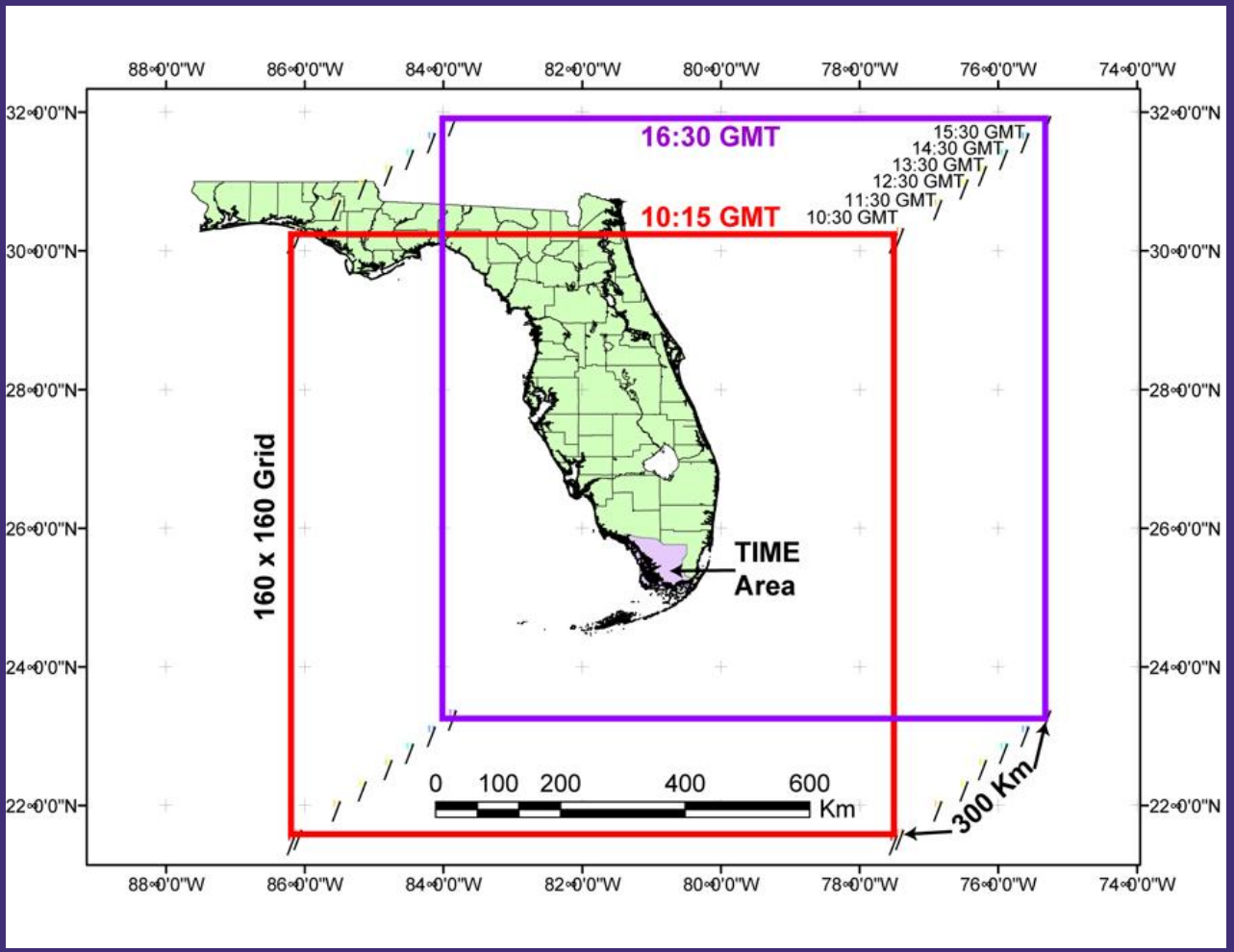
# Extent of Gridded Surface Wind Analysis for Hurricane Wilma

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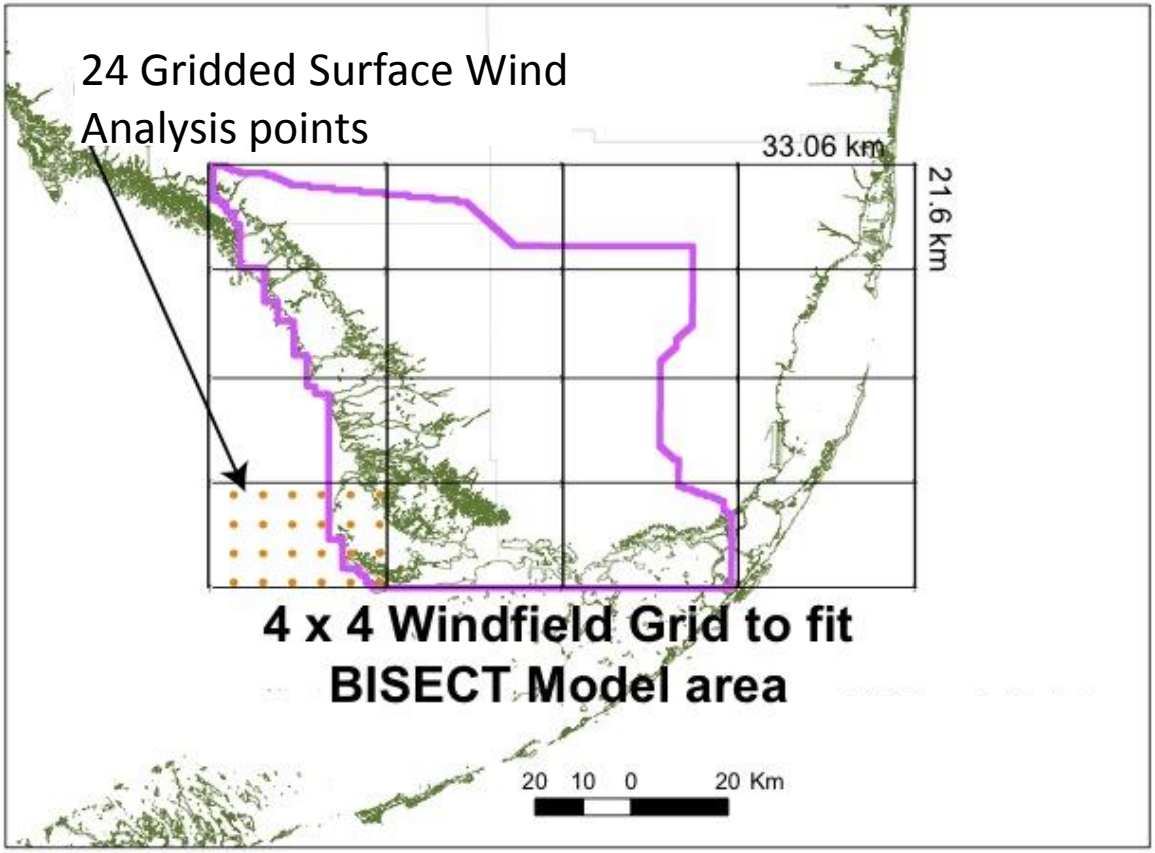
# Deriving 4x4 Hindcast Grid from Wilma Gridded Wind Data

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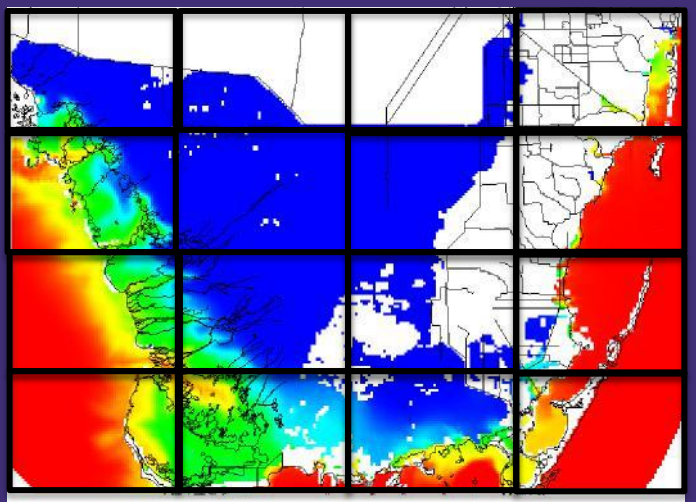
# Comparison of 4x4 Wind Grid to Full Resolution Wind Grid

4 x 4 Wind Grid

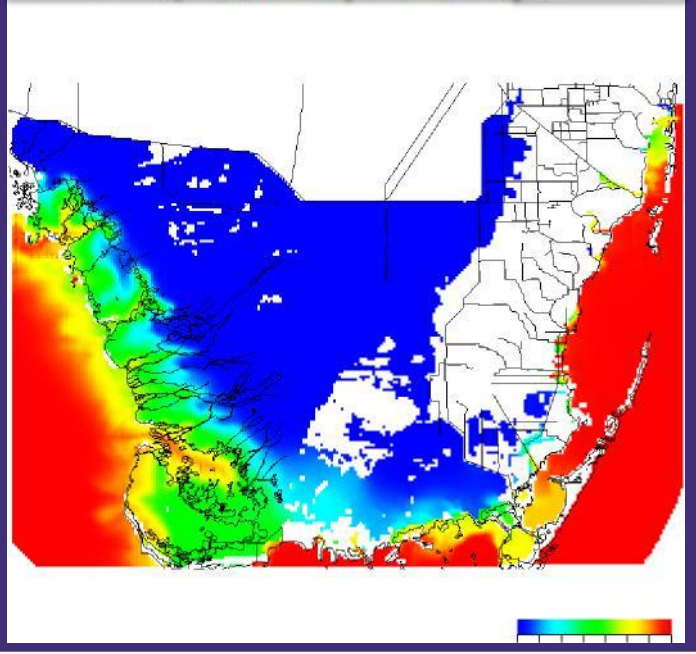


~33 km

~22 km

1996 - 2002
"Near-Hindcast"

Full Resolution Wind Grid



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# Results 1926 – 1932 Hindcast

Miami Beach, 1926

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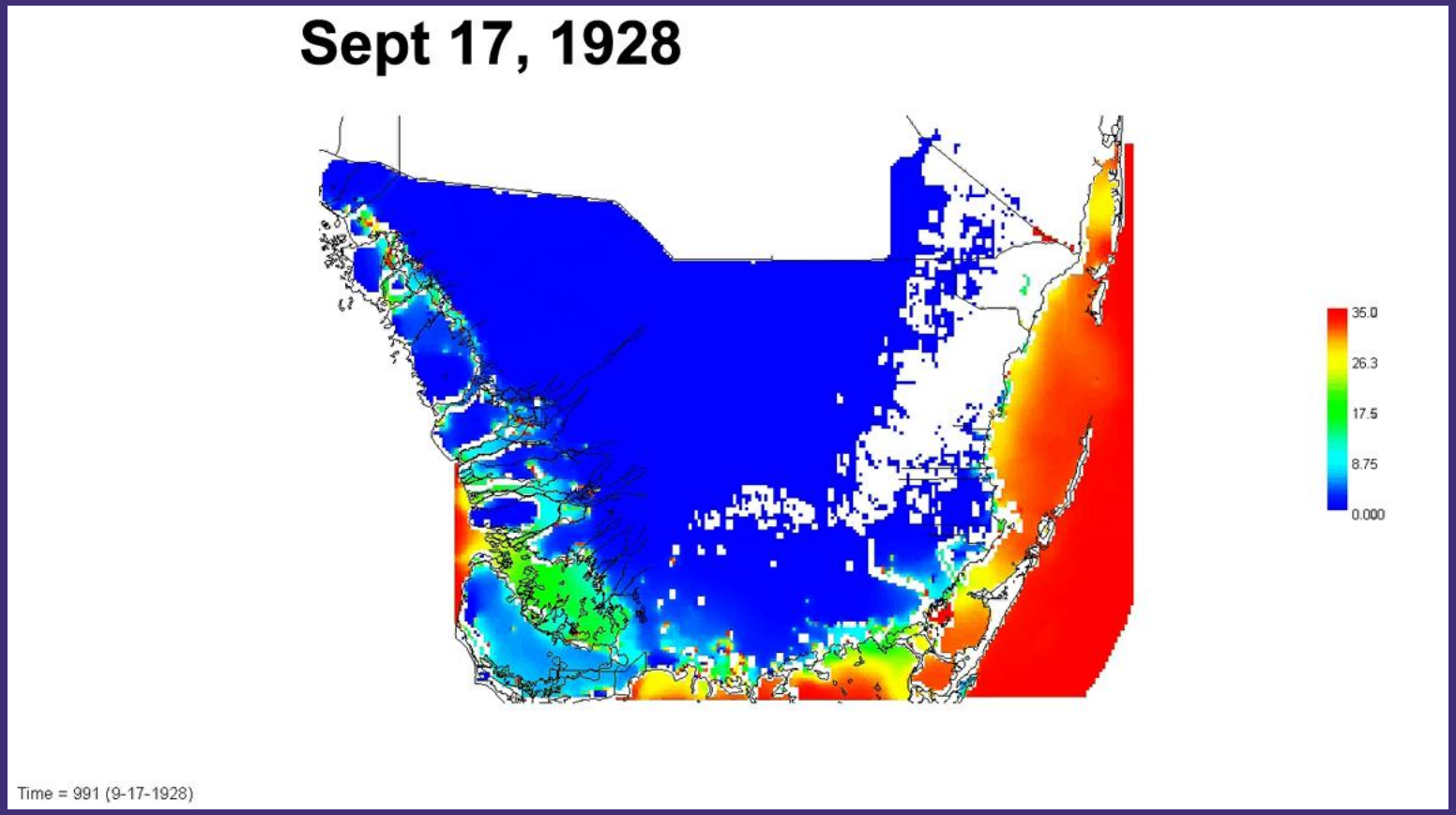
www.srh.noaa.gov/mfl/?n=miami_hurricane

# 1928 Okeechobee Storm as seen in 1926-1932 Hindcast




## “Δ” Inundation

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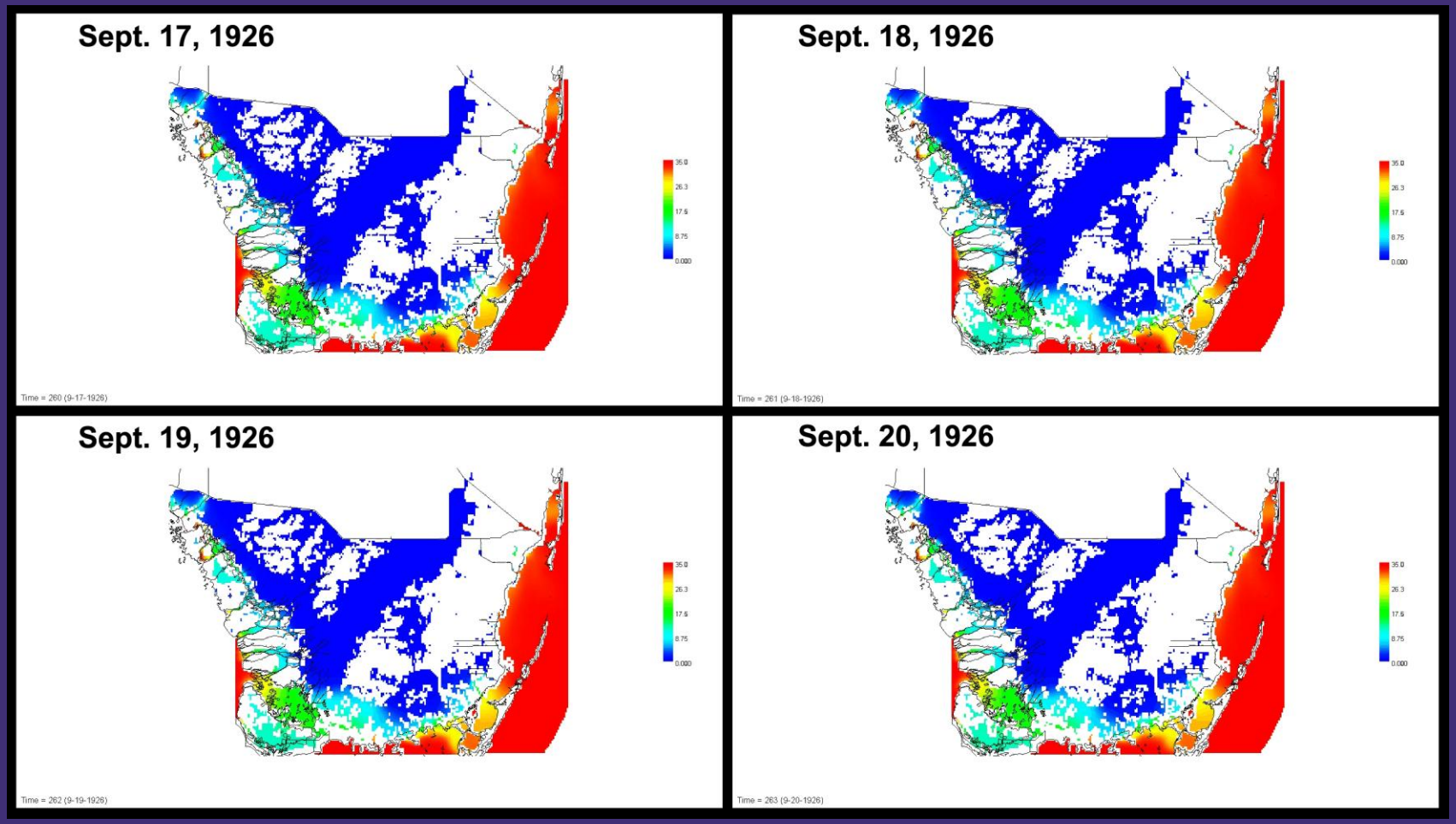
# Initial Hindcast
# 1926 Great Miami Hurricane

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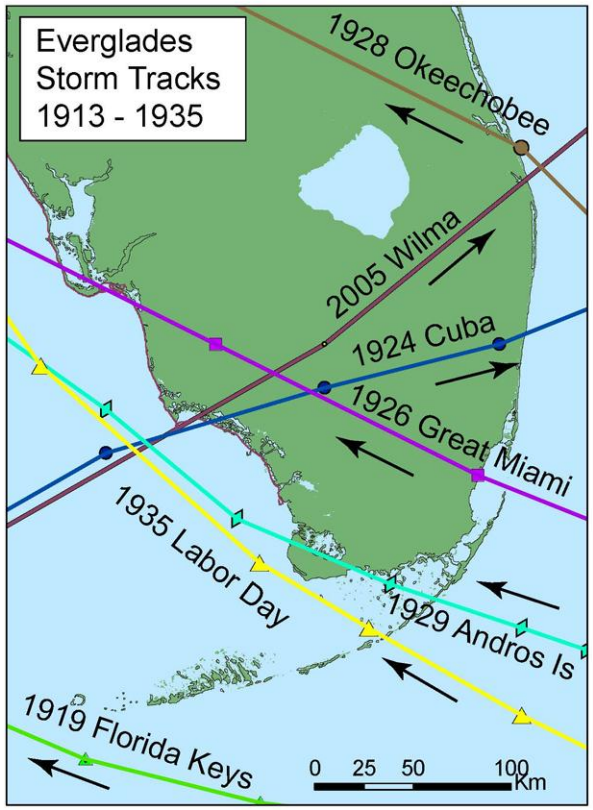
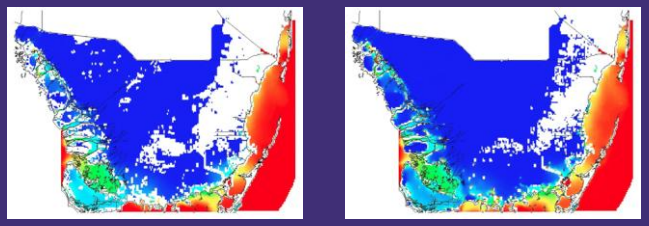
# Measuring Storm "Δ Inundation" from 1926 – 1932 Hindcast



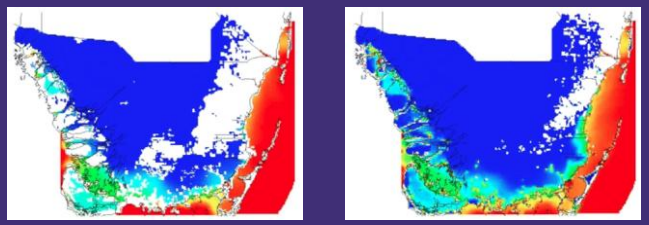

**Km $^2$**

1928 Okeechobee



847

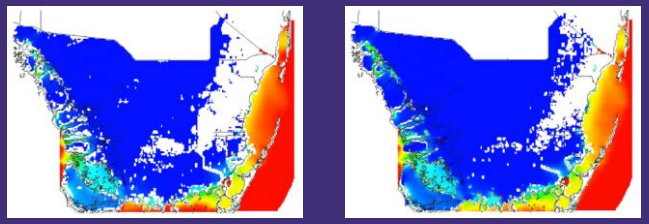
1926 Great Miami



*No Input Data

1788*

1929 Andros Is.



779

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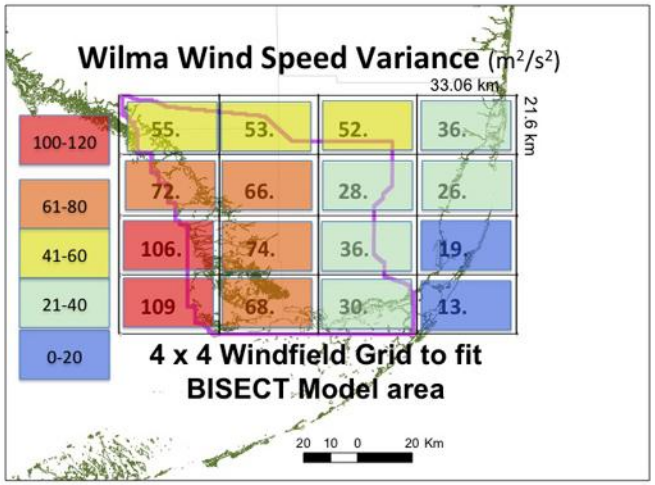
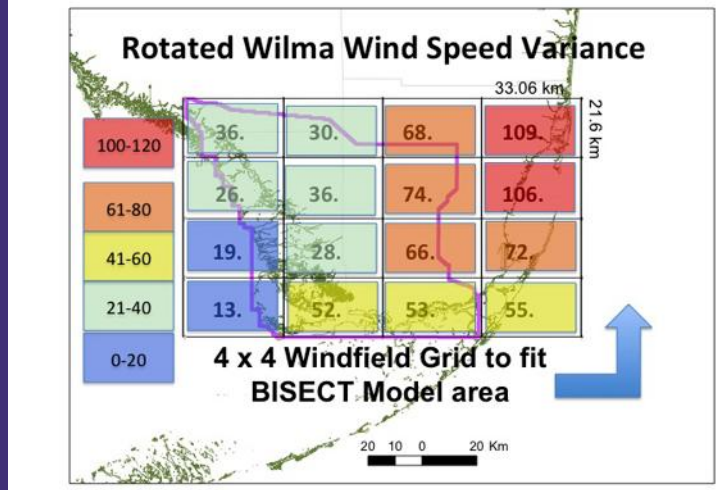
# Modern -> Hindcast Winds

Hurricane Wilma




1926 Hurricane Analogy




-> Transformation of Wind Fields

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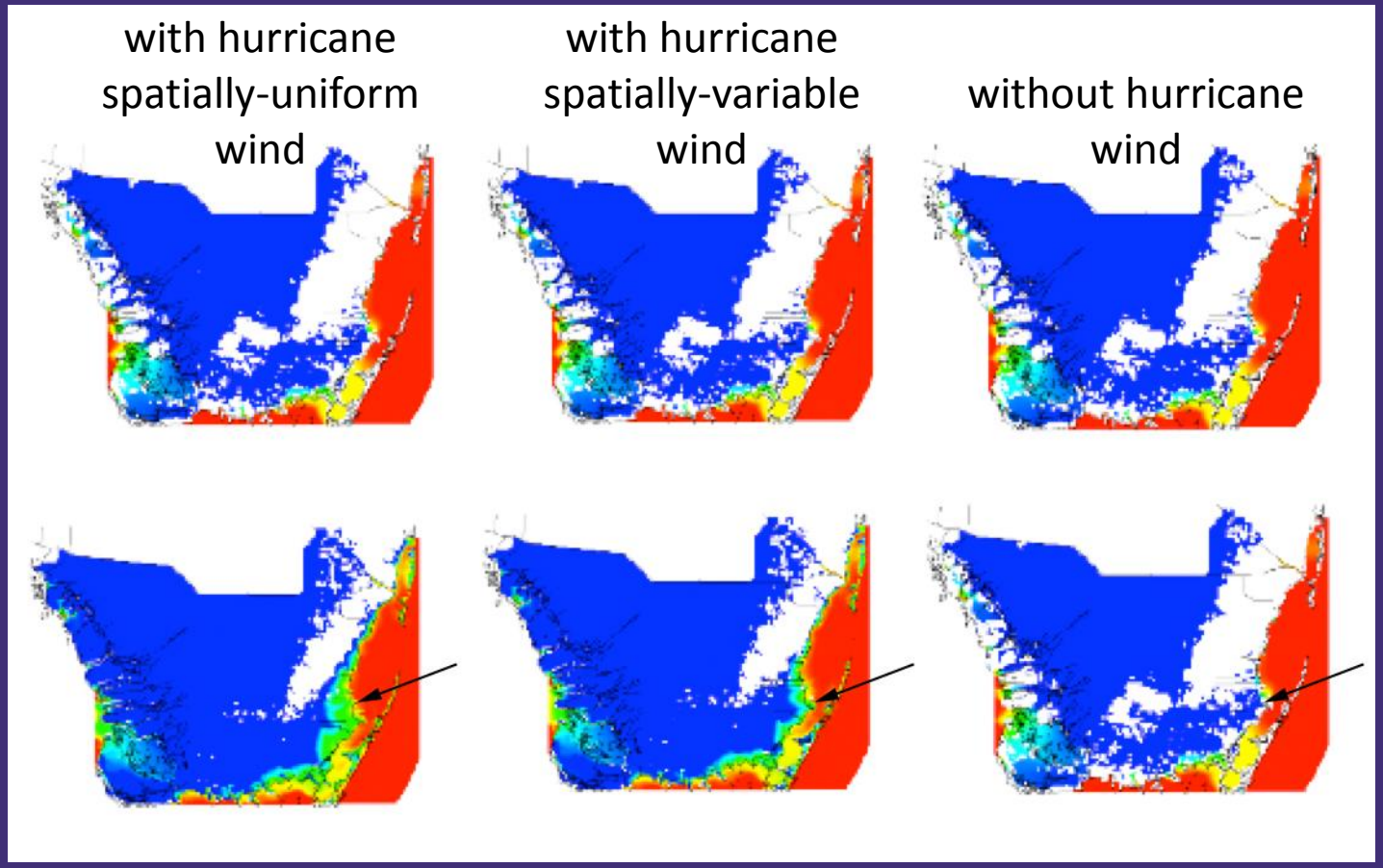
# 1926 Miami Hurricane Hindcast

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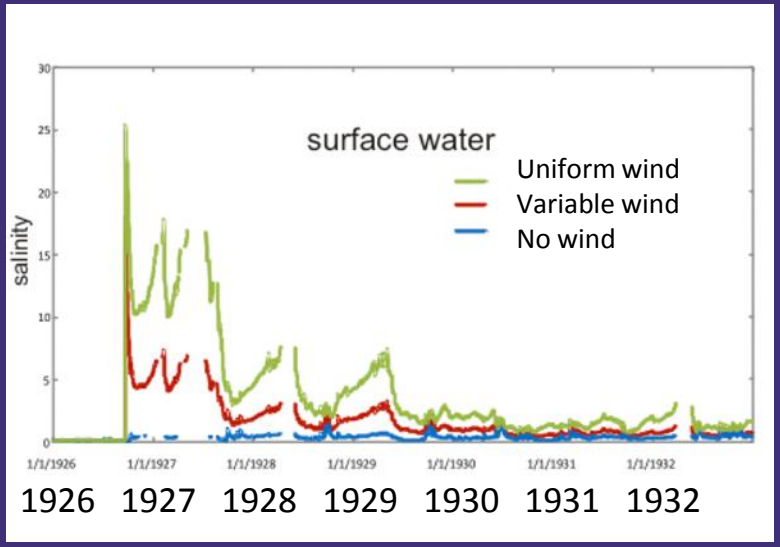
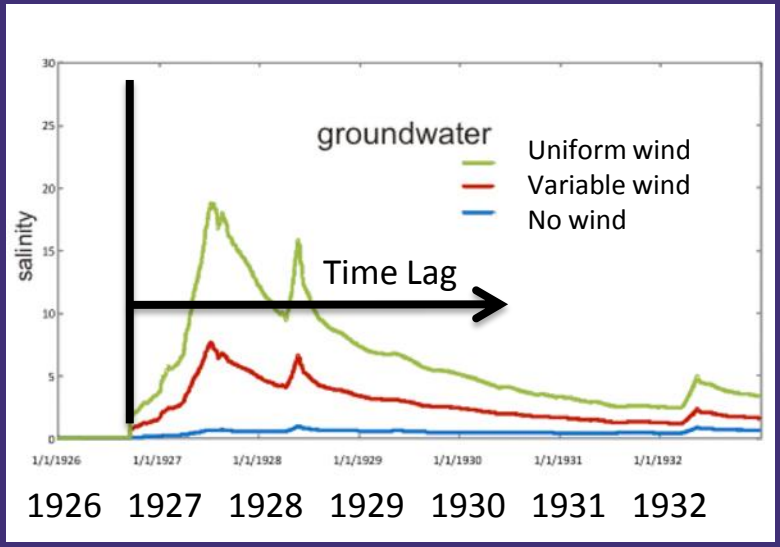
# Predicted Long Term Hydrologic Effects from Hindcast Wind Field

## Surface Water




## Groundwater

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Swain et al, in prep.

# Summary

- 1926 – 1932 hindcast shows good relation to historical events.
- Can make estimates of missing data.
- Able to simplify modern wind data.
- Modern wind surrogates for hindcast.
- *First steps in making futurecasts…*

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