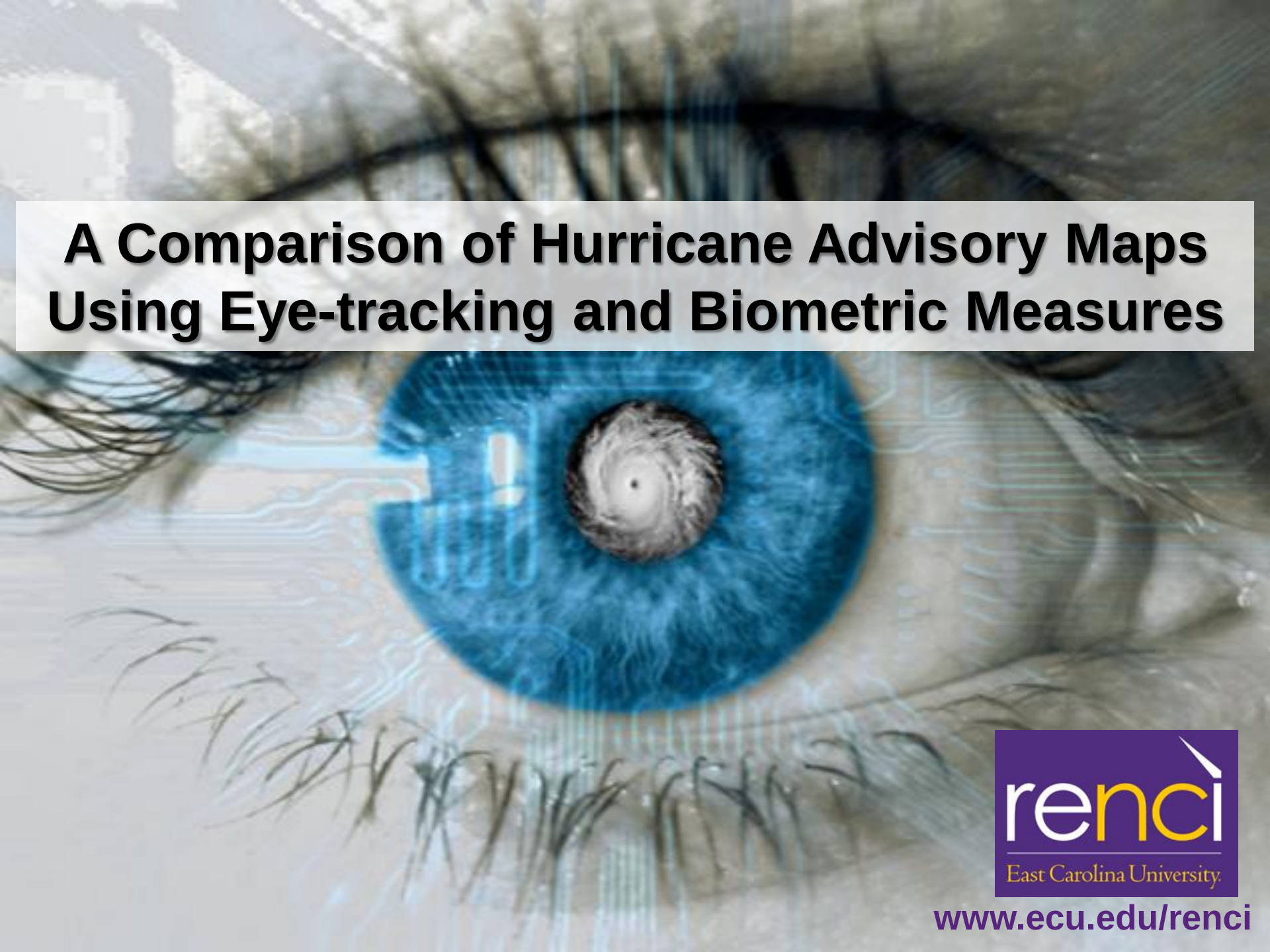


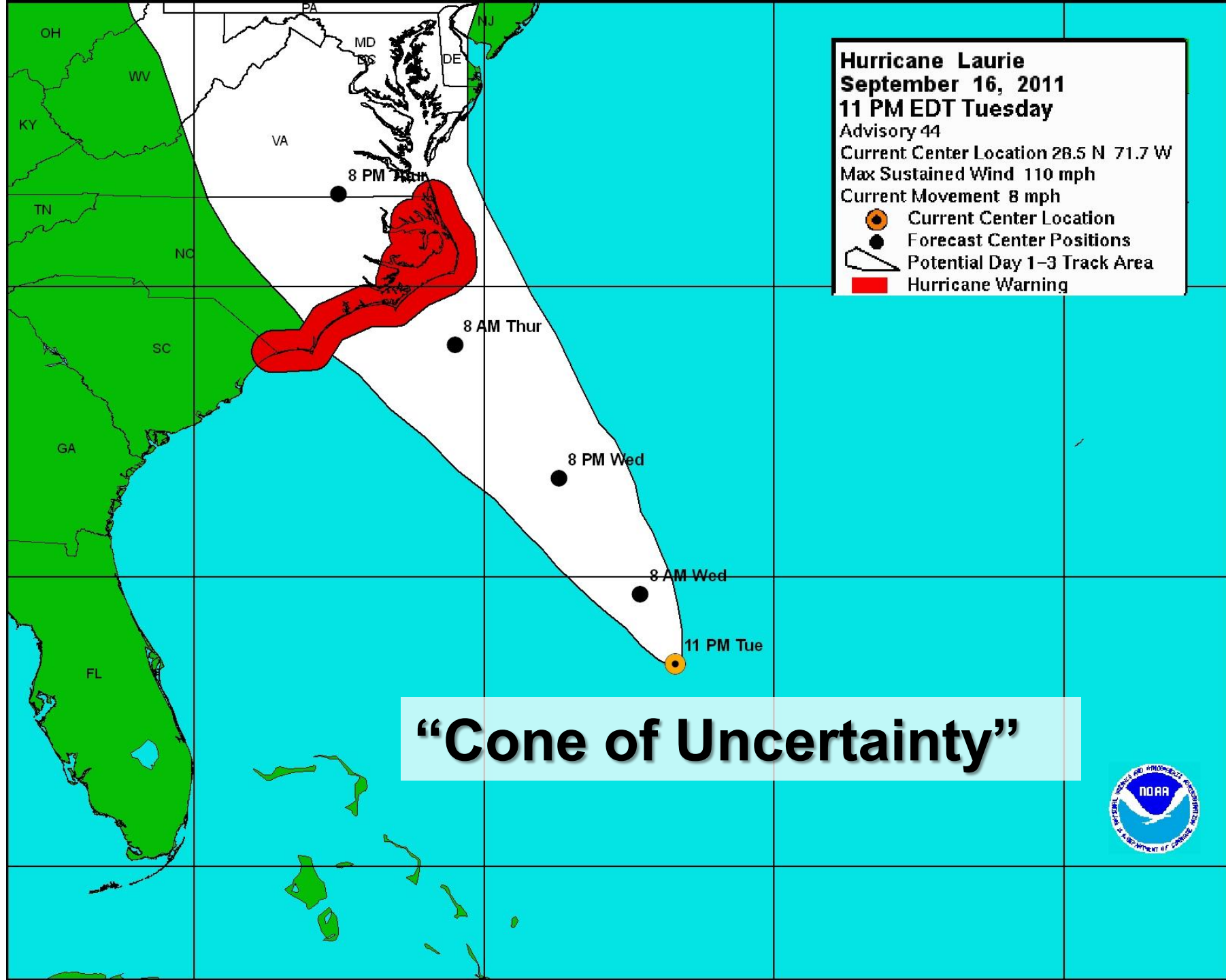




A Comparison of Hurricane Advisory Maps Using Eye-tracking and Biometric Measures

A close-up photograph of a human eye. The eye is looking directly at the camera. A blue contact lens is visible on the eye. The iris is a light blue color. The eyelashes are dark and long. The skin around the eye is fair.

Tom Crawford, Geography
Tom Allen, Geography
Laurynas Gedminas, Geography
Nick Murray, Kinesiology
Donna Kain, English





INDIVIDUAL PERCEPTIONS



MODIFYING FACTORS

Demographics
Socio-psychological
Structural variables

LIKELIHOOD OF ACTION

Perceived *benefits* of preventive action

Perceived *costs/barriers* to preventive action

Perceived susceptibility
Perceived severity

Perceived threat

Likelihood of taking recommended preventive action

Cues to action:

- Media campaign
- Advice from others
- reminder postcard
- Experiences
- News or magazine

Risk Perception & Behavior Model

After: Health Belief Model



- major cause of stroke
- very addictive
- raises blood pressure
- suppresses immune function
- dulls senses of smell and taste
- reduces stamina
- wrinkles your skin
- leads to depression and fatigue
- may cause fatal heart attacks
- may cause emphysema
- may cause gum disease
- may cause cancer



Smoking Kills

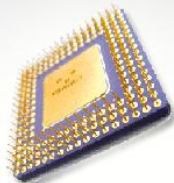
...so why bother starting?



INTRODUCING THE WORLD'S FIRST DIGITAL WALKING SHOES.

The New Balance Speed-Demon.

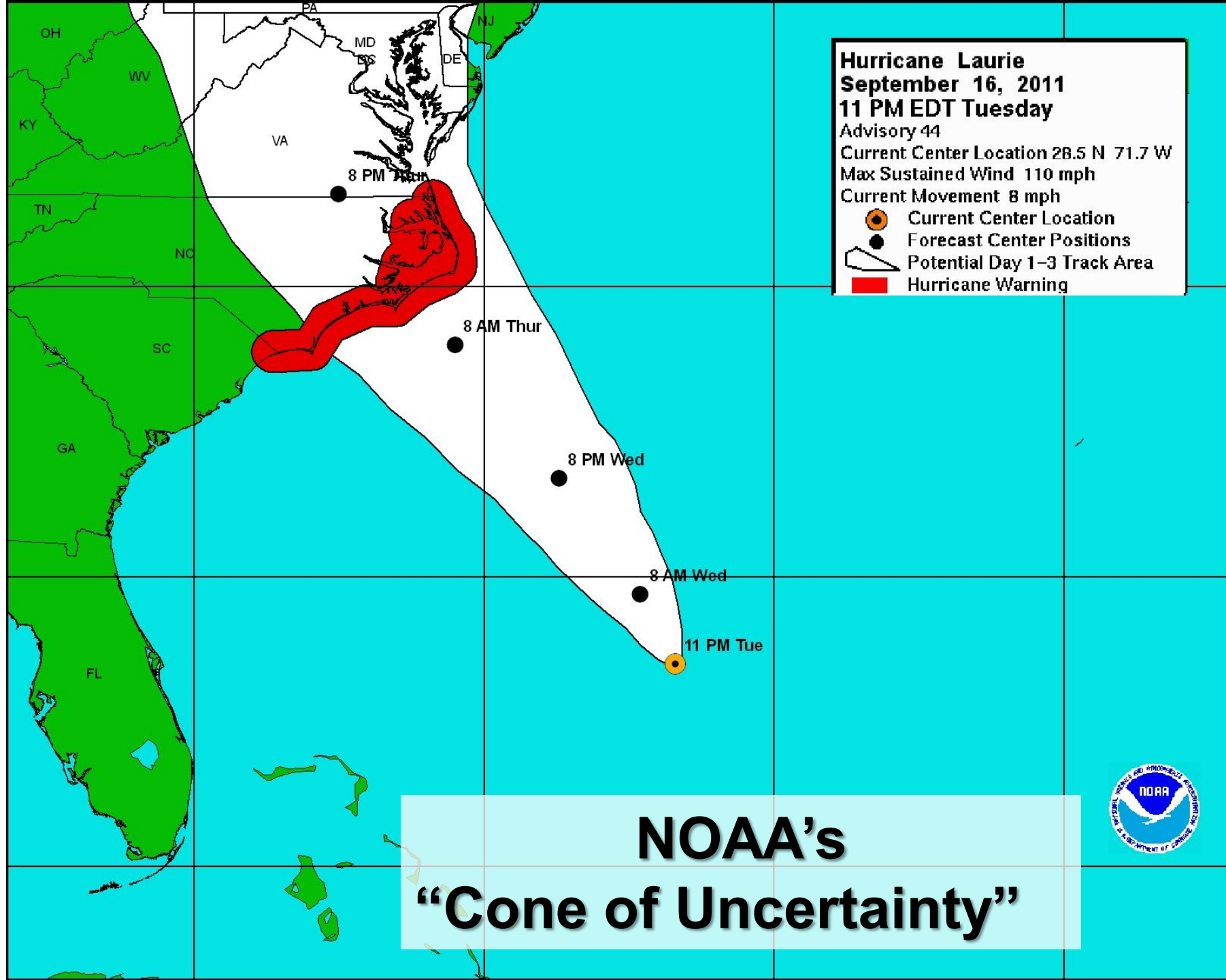
(Available in stores, November 1, 2007)

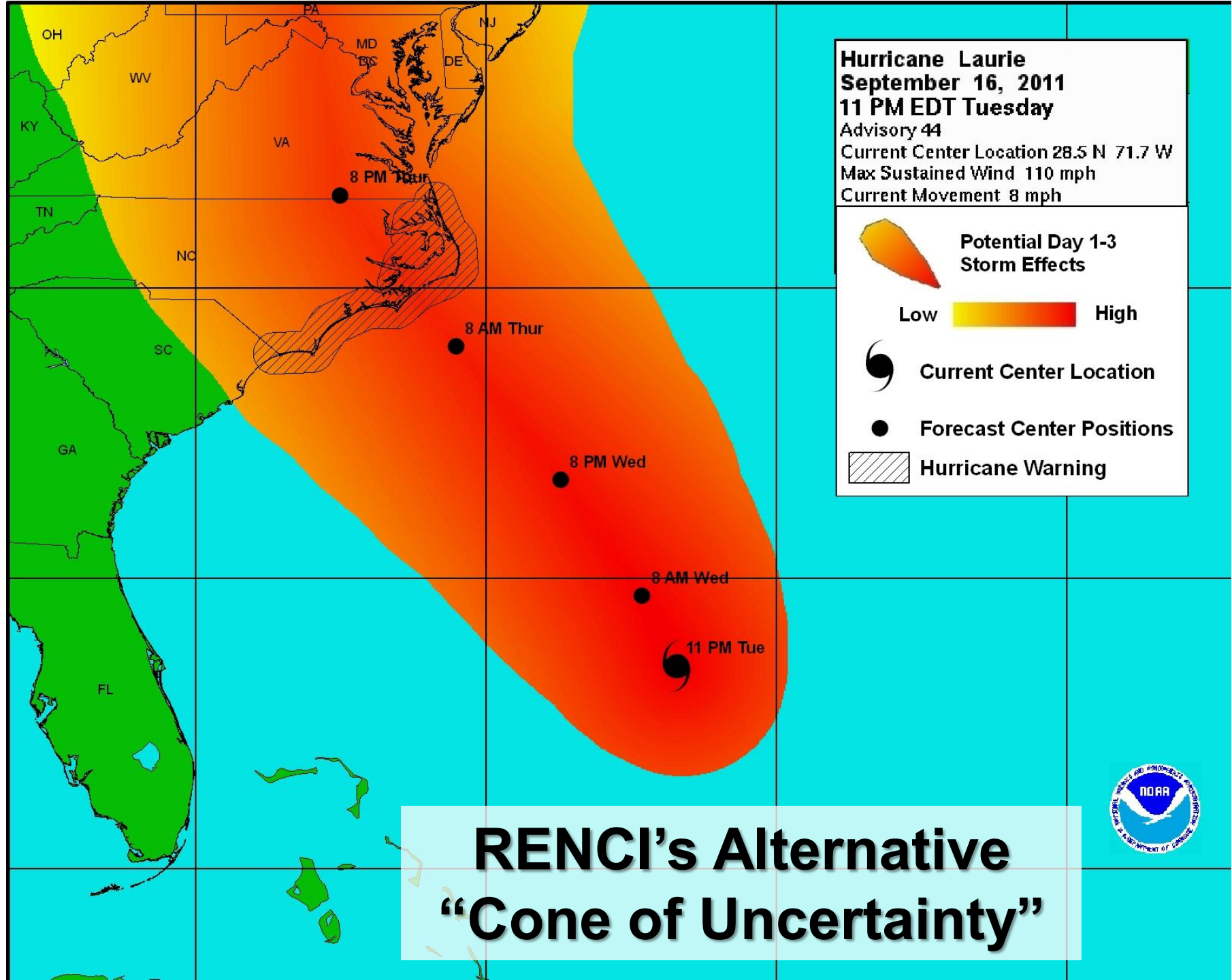


Below each sole lies an imbedded chip. This chip is NOT a GPS system. Although if needed, we can probably make one for a shoe. . . .
DESIGNED TO KEEP TRACK OF RUNNING DISTANCE AND TO MONITOR YOUR OVERALL HEALTH.

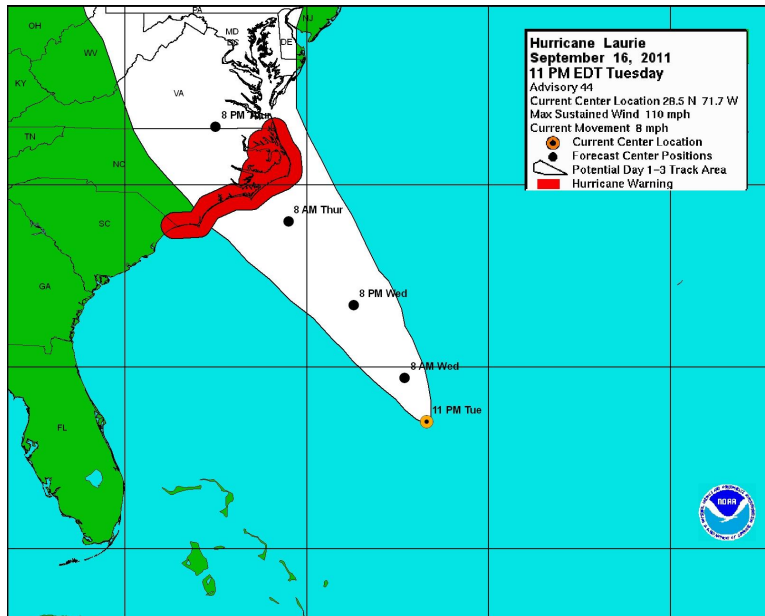
© 2007 New Balance Shoes. Boston, MA 02135. Visit us online at www.newbalance.com





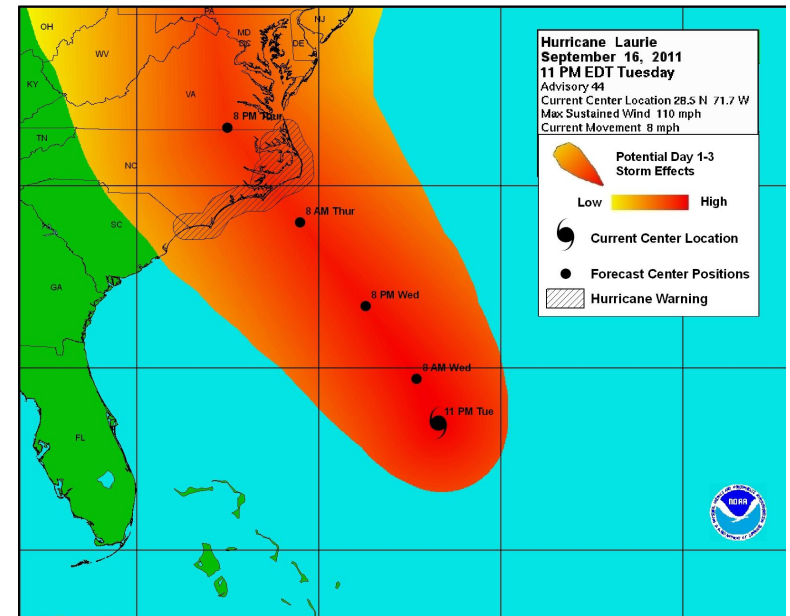


A Scientific Approach to Geovisualization



**NOAA
Cone of Uncertainty**

VS.



**Alternative
Cone of Uncertainty**

Research Questions

- Which map performs better, NOAA or Test?
- Are there biological behavioral differences between the two maps? Eye-tracking, brain activity, heart rate, skin response?
- Do people perceive risk better, can they answer content questions correctly?
- Which map do people prefer to use?

Desired Results

- Test cone performs better than NOAA biometrically (more arousal/stimulation)
- Test cone aids perception of risk in terms of correctly answering questions.
- Test case is preferred to existing cone.
- A “difference that makes a difference”

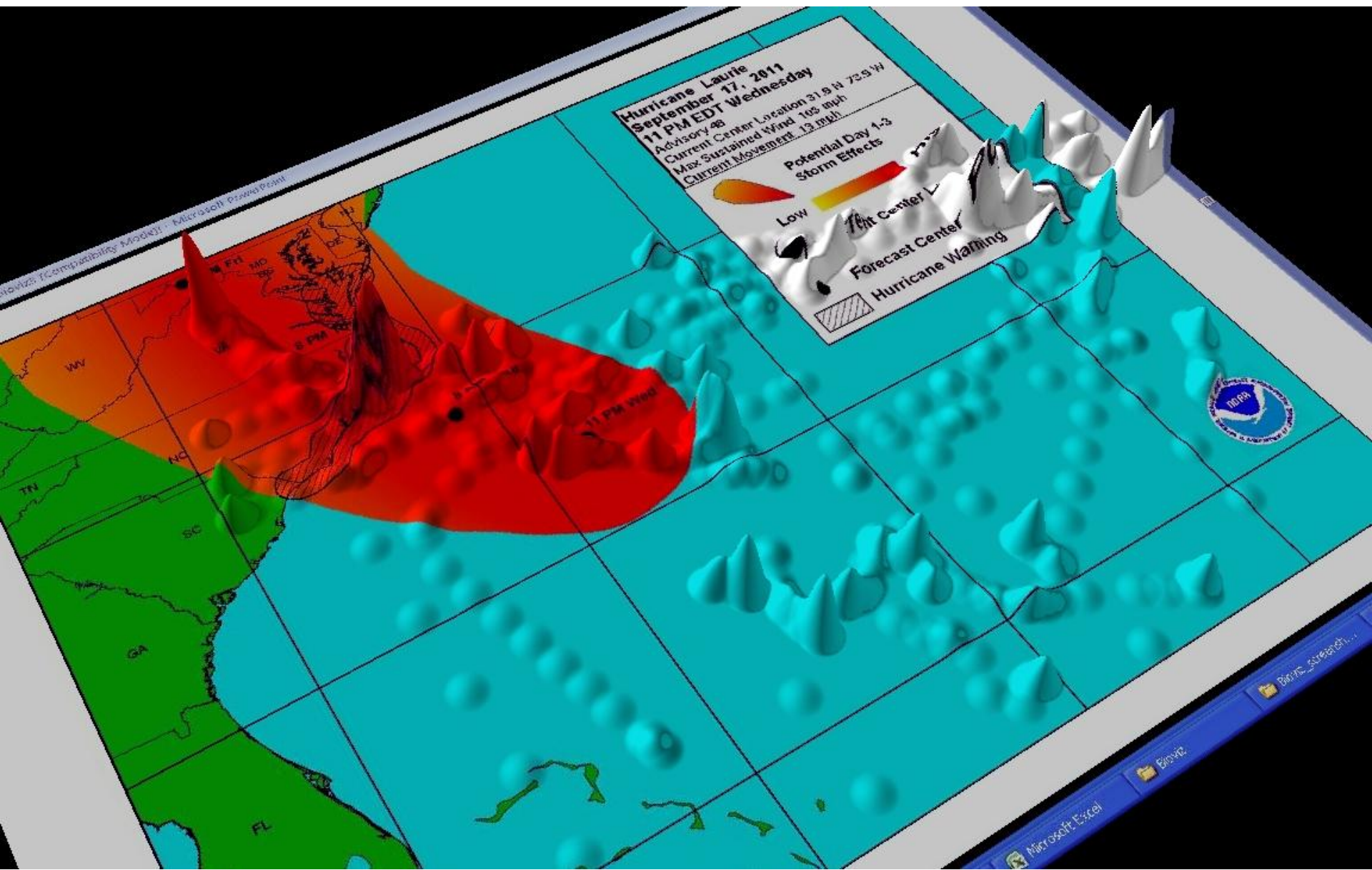
PROJECT BIOVIZ

Cartography, Biometrics, and Risk Perception

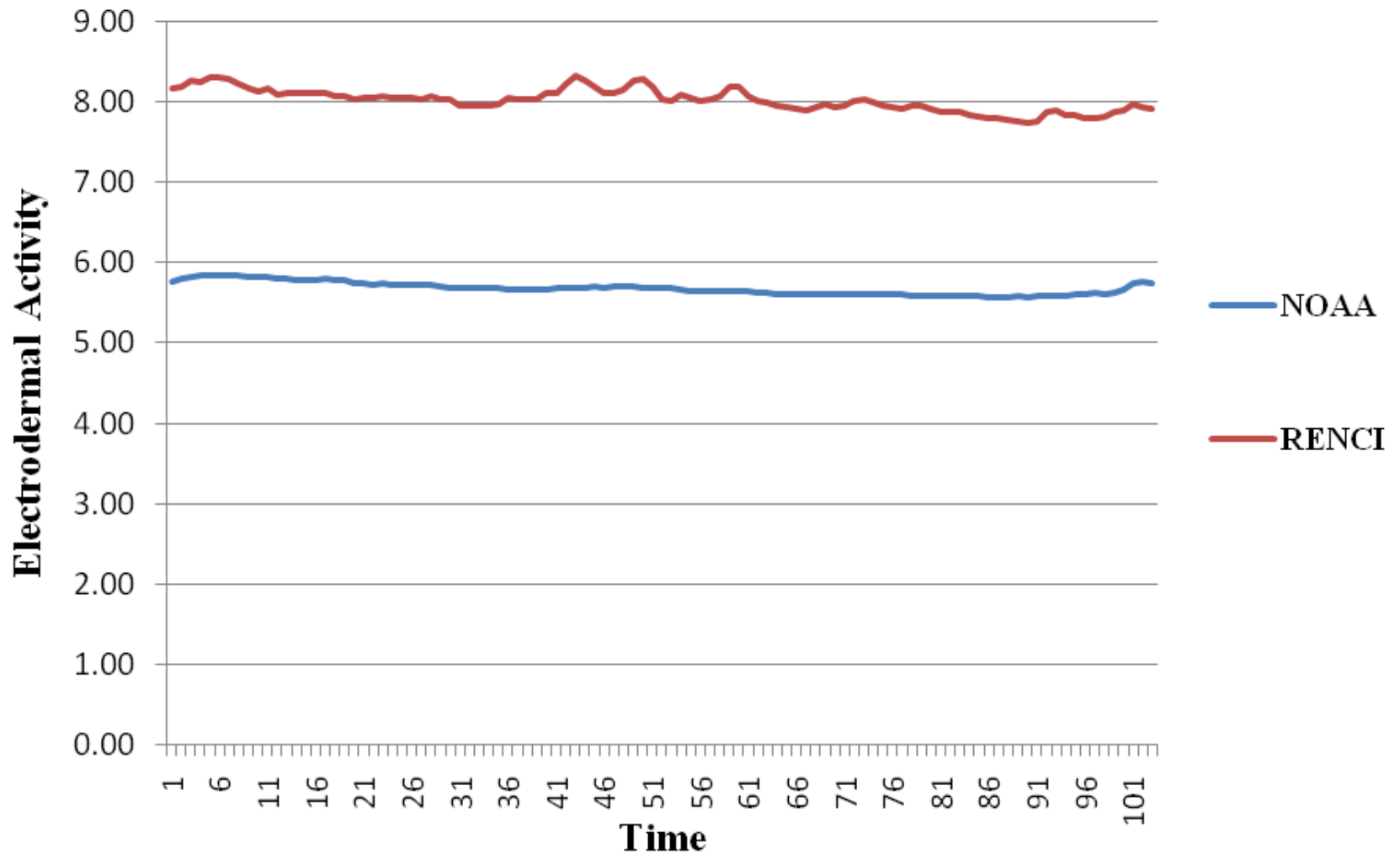
- Eyetracking (fixations)
- Brain activity (EEG)
- Heart rate (ECG)
- Skin response (EDA)
- Facial movement (EMG)



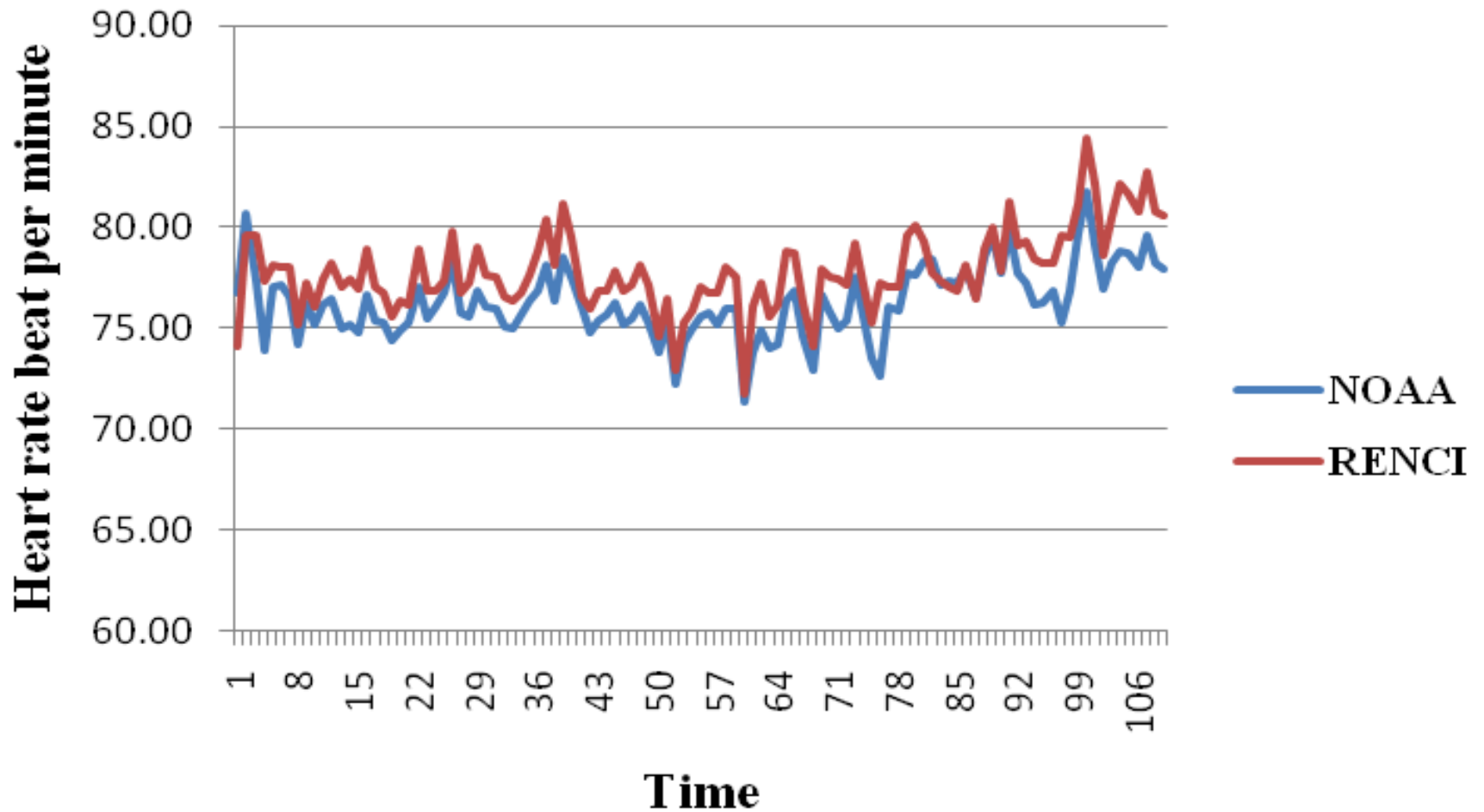


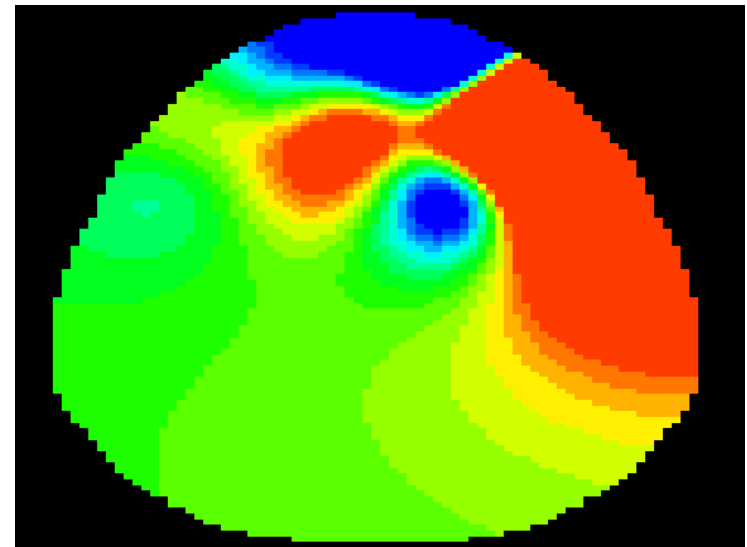
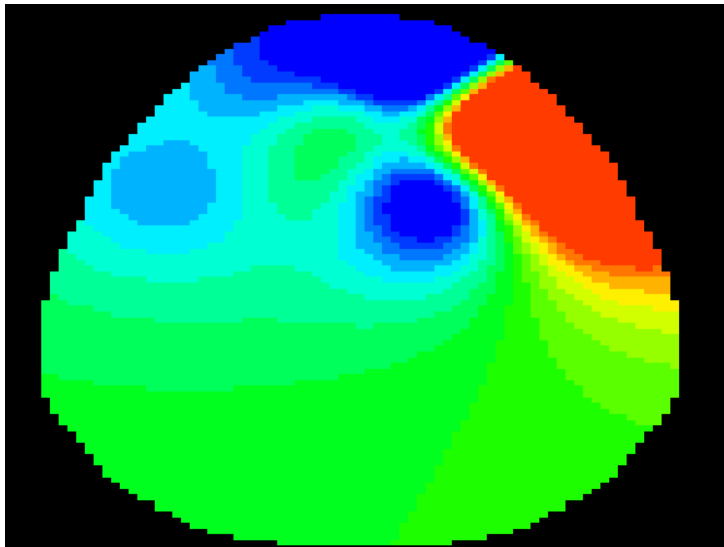
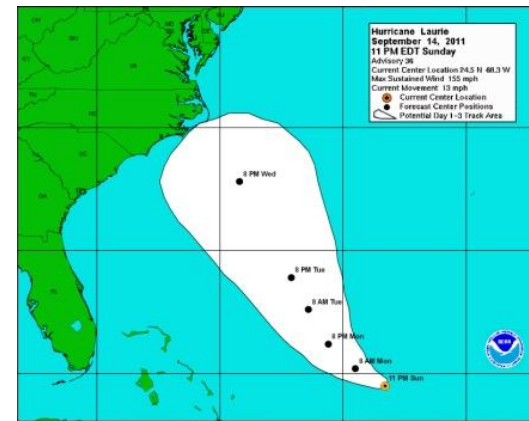
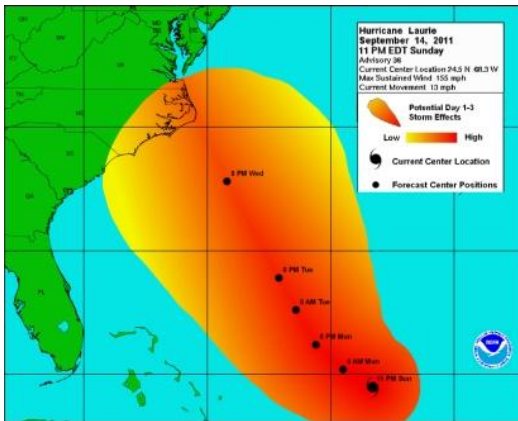


Skin Response (EDA)



Heart Rate





Increases in Alpha represent decreases in the cortical activation.

Brain Activity

Results Summary

Biometric	NOAA	RENCI	p-value
EMG (brow)	0.000581	0.000693	0.31
EMG (cheek)	0.000609	0.000516	0.42
EDA (skin)	5.680	8.376	0.45
Heart rate	72.1	73.6	0.76
Eye fixations	308.2	298.2	0.66
Eye fixations (legend)	63.9	90.1	0.14
Left brain dominance	0.364	0.425	< 0.05

Did they get the right message?

9 True/False Hazard risk questions:

The hurricane eye is certain to be located somewhere inside the cone.

T F

There is a zero likelihood that the South Carolina coastline will experience damaging affects from the storm.

T F

Locations along the North Carolina coast may experience damaging affects of the storm by 8am Thursday.

T F

Locations outside the cone have a possibility of feeling damaging effects of the storm.

T F

There is a zero likelihood that the hurricane eye will strike the Virginia coastline?

T F

Did they get the right message?

- Chi-square: no sig. differences for any of the 9 questions.
- T-test for mean correct out of 9:
NOAA 6.94 RENCI 6.41 $p = 0.212$
- NOAA 77.1% RENCI 71.2% correct

Map Preference?

- Which map do you feel is easier to understand?

RENCI 70.5%

- Which map do you think is more attractive?
RENCI

RENCI 85.2%

- Which map would you prefer to use?

RENCI 94.1%

Conclusion

- Mixed biometric results.
- Key difference was for brain activity showing left dominance and positive affect for RENCI.
- No significant differences in risk communication, *but RENCI did not perform worse in survey.*
- Strong preference for RENCI over current cone.
- Issue of small sample.
- Future work.



Participant Characteristics

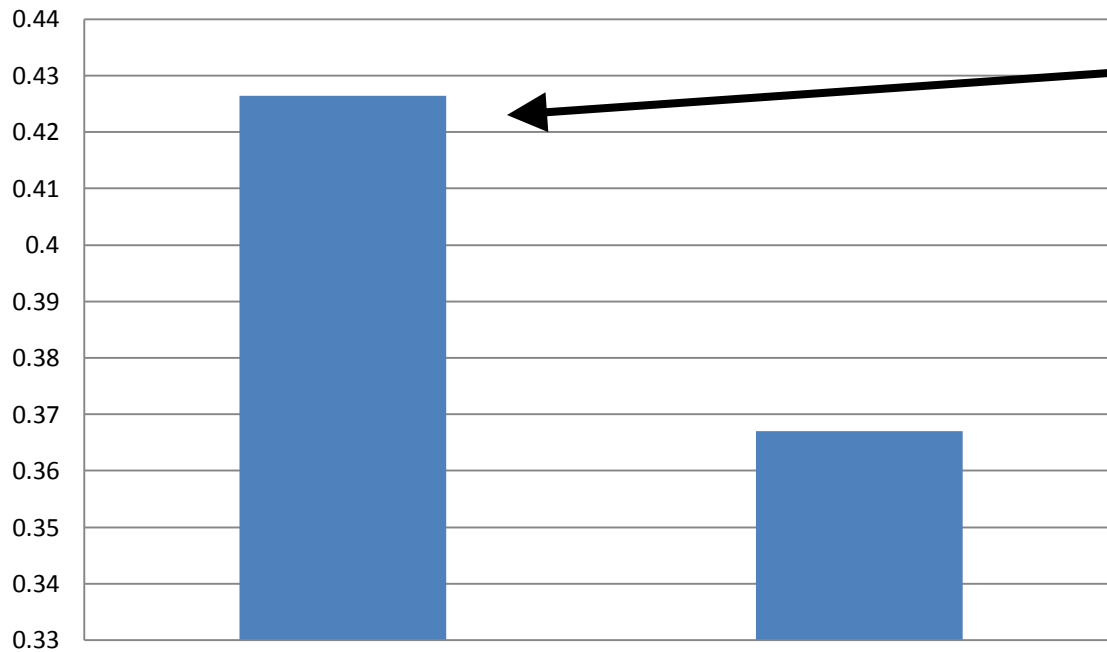
- Age: 18-29, mean = 21.8, std. = 2.5
- Year: 76.4% juniors/seniors
- Gender: 50/50
- Evacuation experience: 23.5% yes
- Self-reported knowledge of hurricane risk:
 - 62% average
 - 21% above average

Research Design

- Recruited 34 ECU students with \$20 food card.
- Biometric measurement in a 45-60 minute lab session.
- Participants view map animations of NOAA and RENCI cone maps; half saw NOAA first and half saw RENCI first.
- Survey questions: demographics, risk perception, map preference.

Brain Activity

Alpha Asymmetry



Left Frontal Dominance
Color Cone

$$F(1, 496) = 3.724, p < .05$$

Color

White

