Communicating Hurricane Information

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Our role as technical collaborators

- Working with Mike Lindell and Carla Prater at Texas A&M
- Development of *Dyna Search*
  - Automating time/event based information search tasks
- Exploring enhanced display technologies
  - A study of new ways to present predictive information containing high levels of uncertainty

Dyna Search

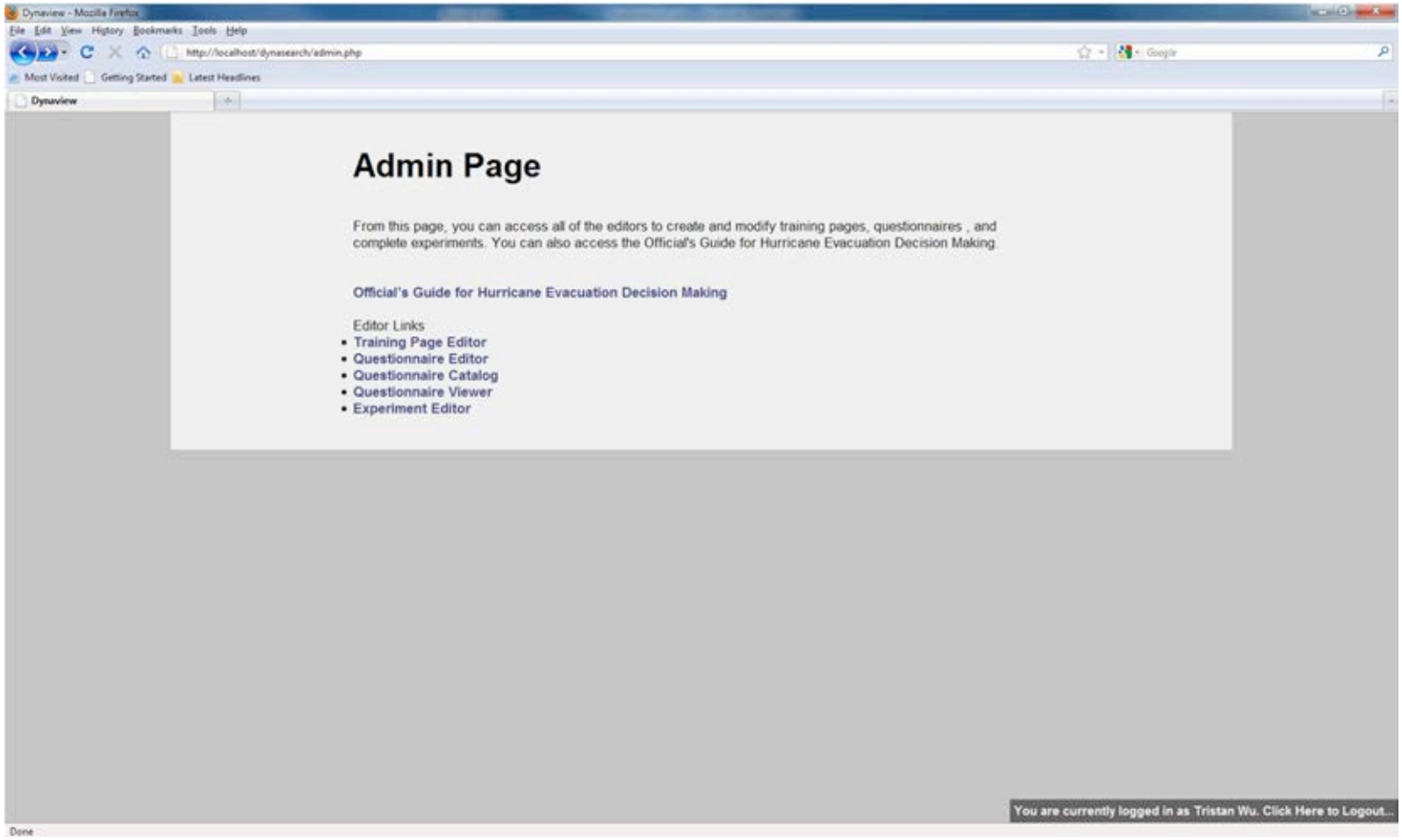
Dyna Search

- System for developing and administering time/ event-based information search tasks
- Web based
- Facilities for automating
  - Instrument construction,
  - experiment administration,
  - data collection.

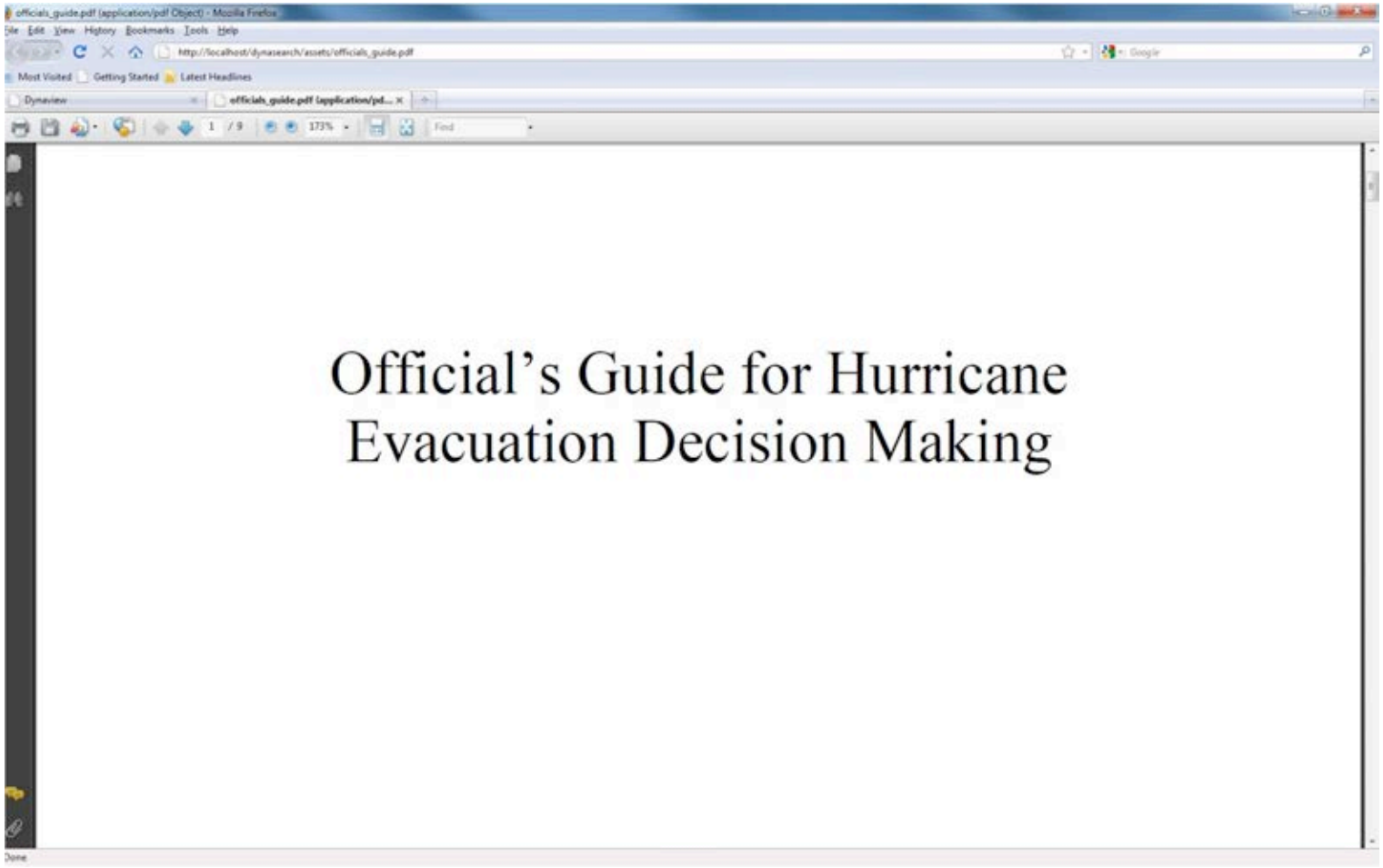
Supported screen types

- Login for user identification and registration,
- Size registration,
- Instruction,
- Training (information search),
- Survey.

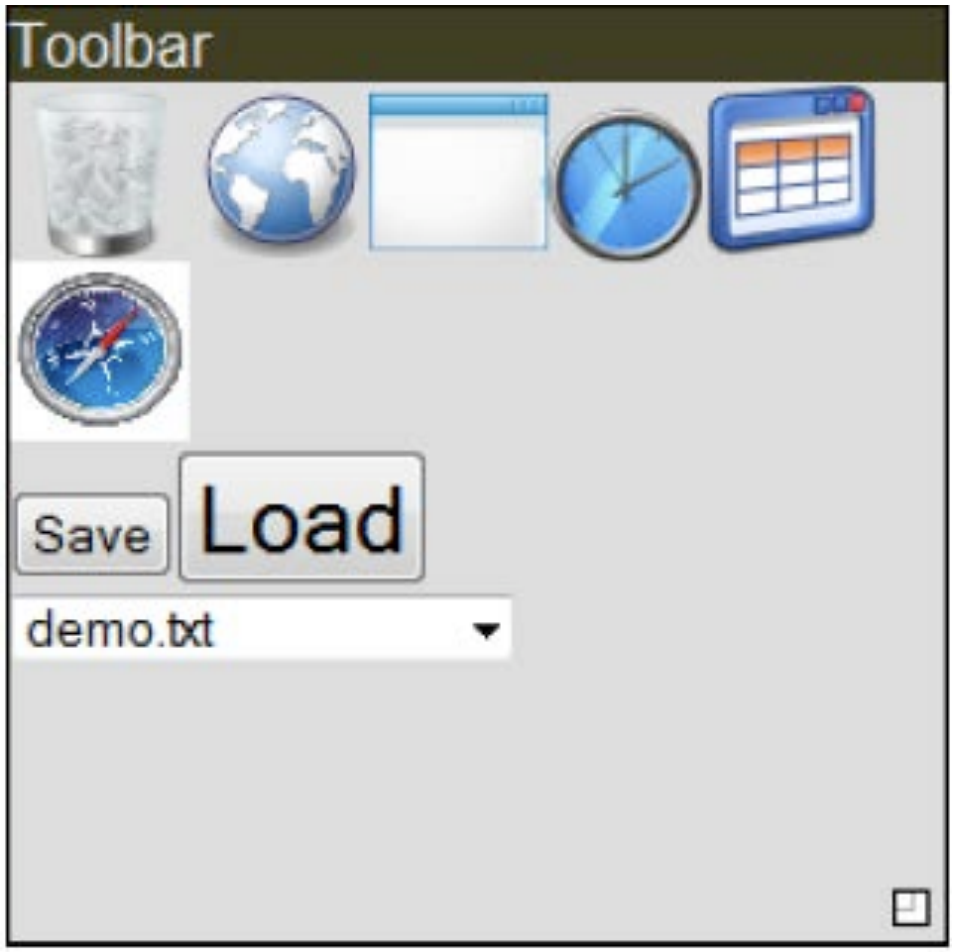
Accessing the editor



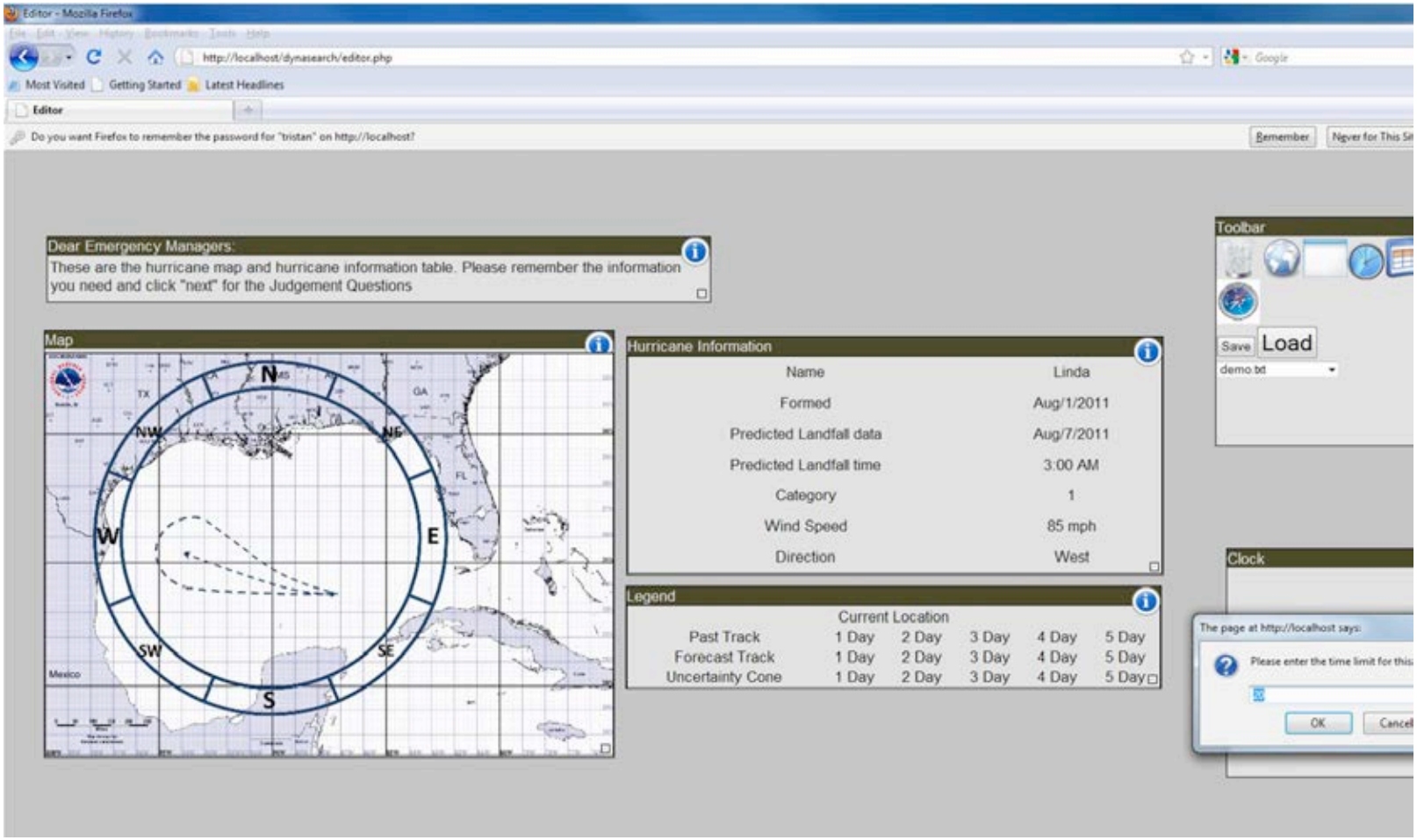
Example instruction screen



Building a training screen

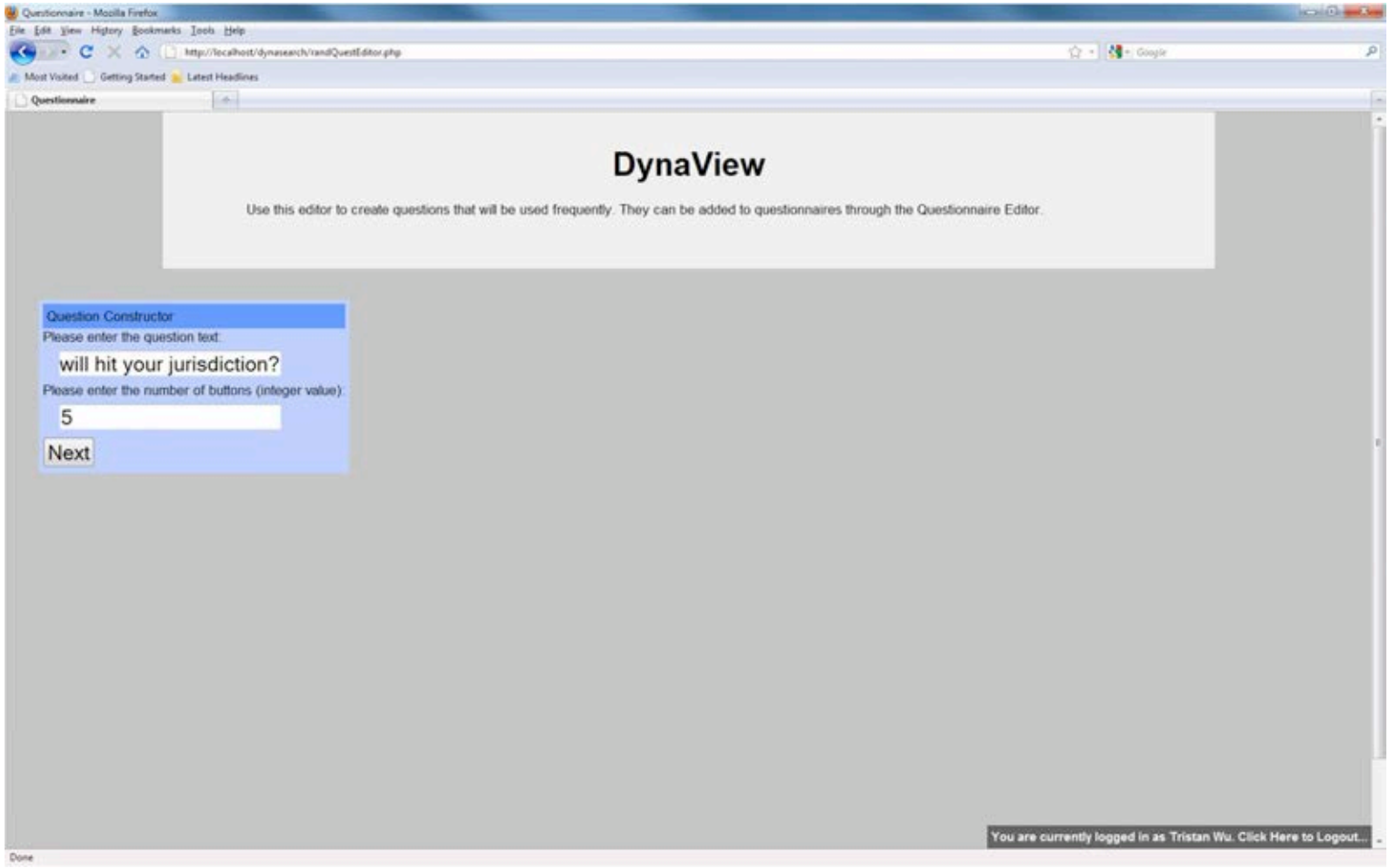


Building a training screen

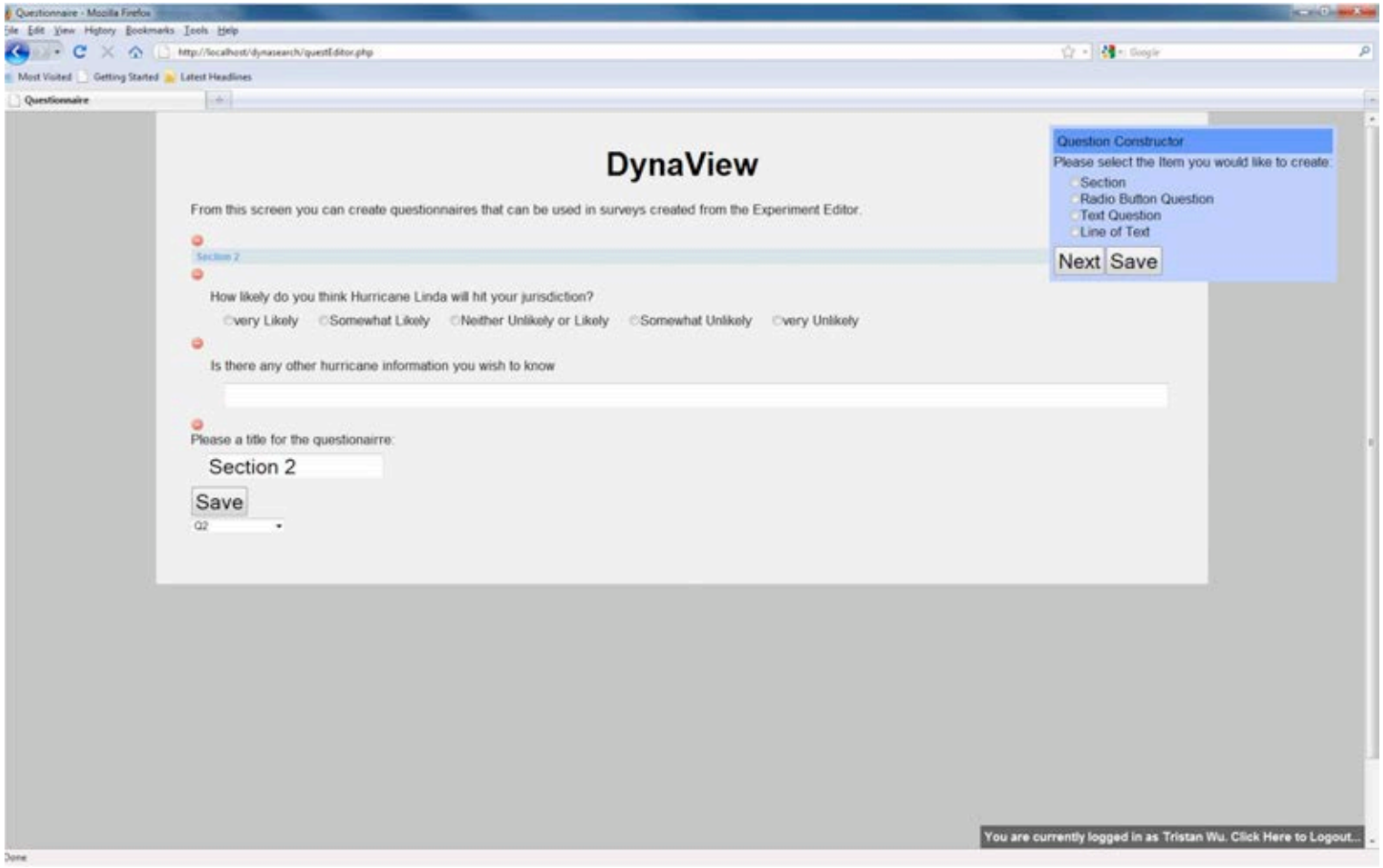


A text entry question

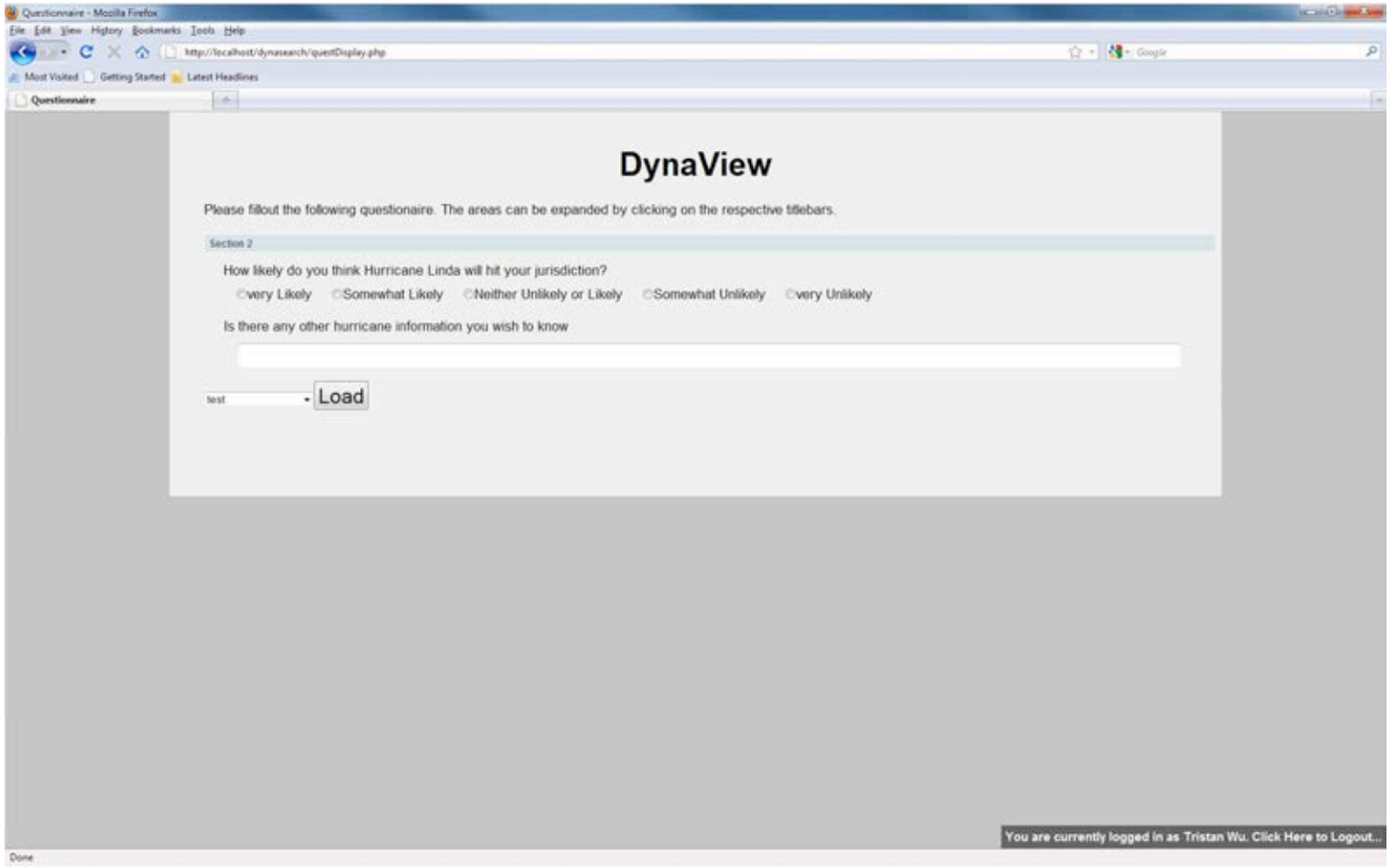
Steps in constructing a question



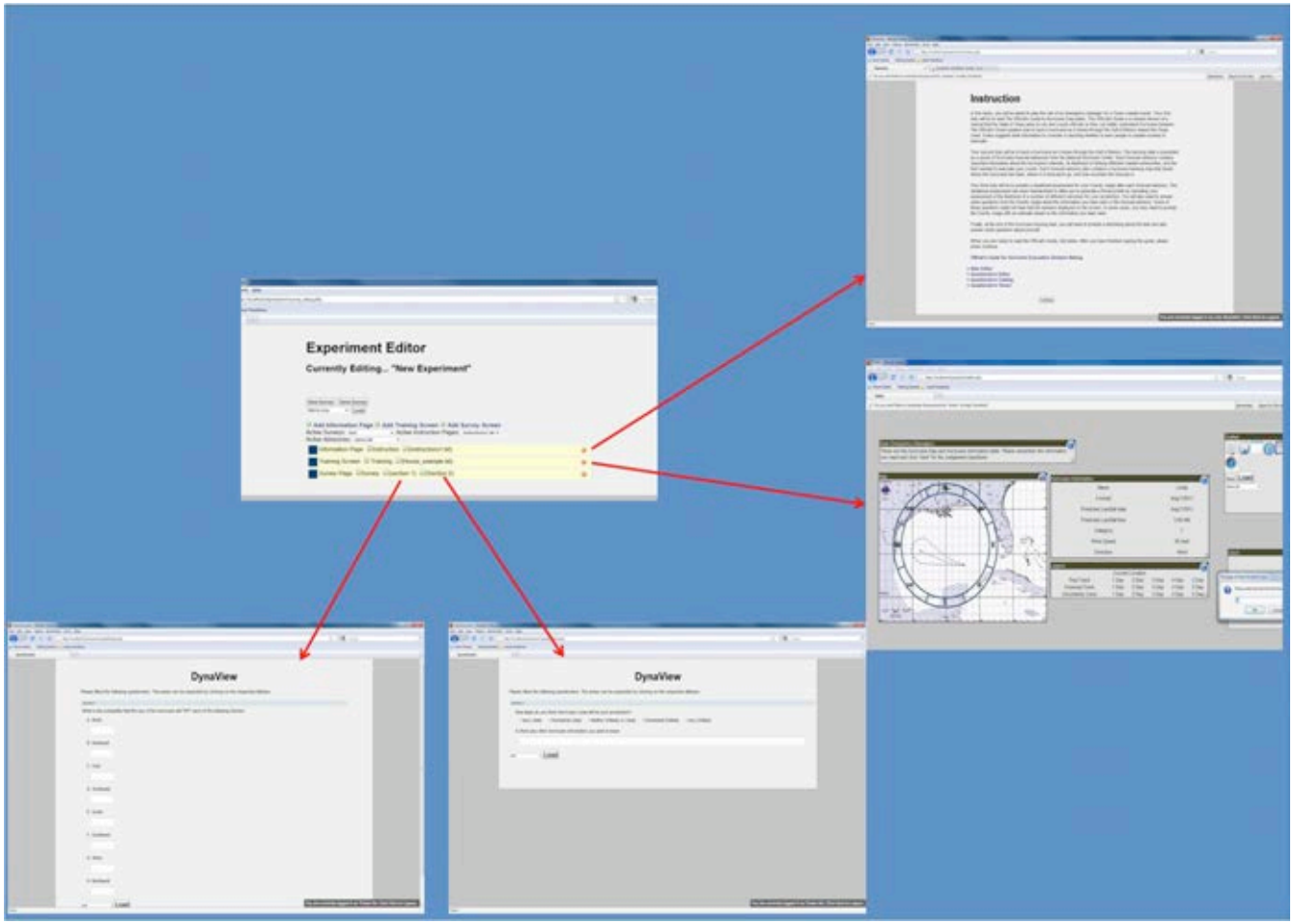
Saving a finished question



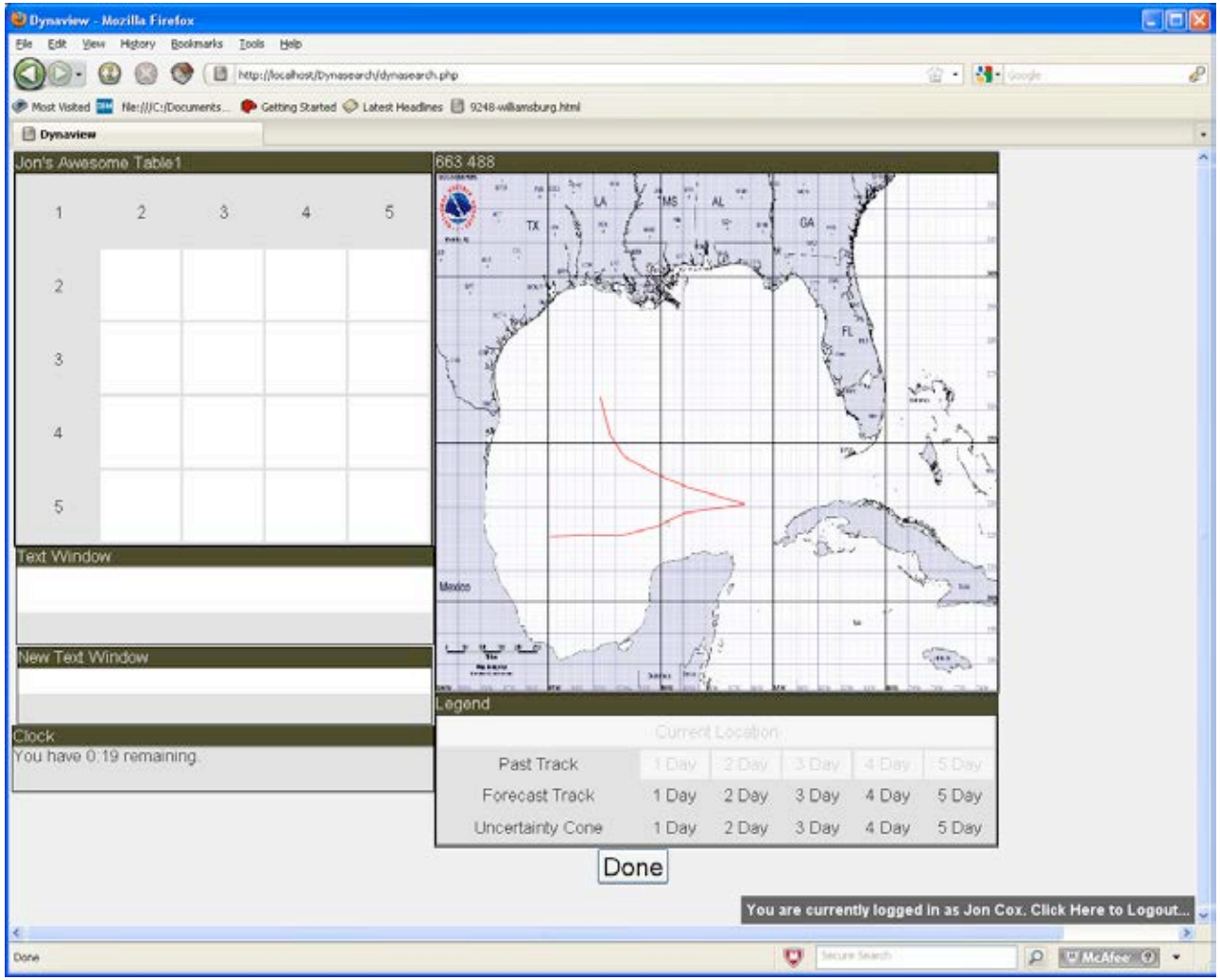
Loading question from a catalogue



Overview of experiment editor



Example user view



Results saved to database

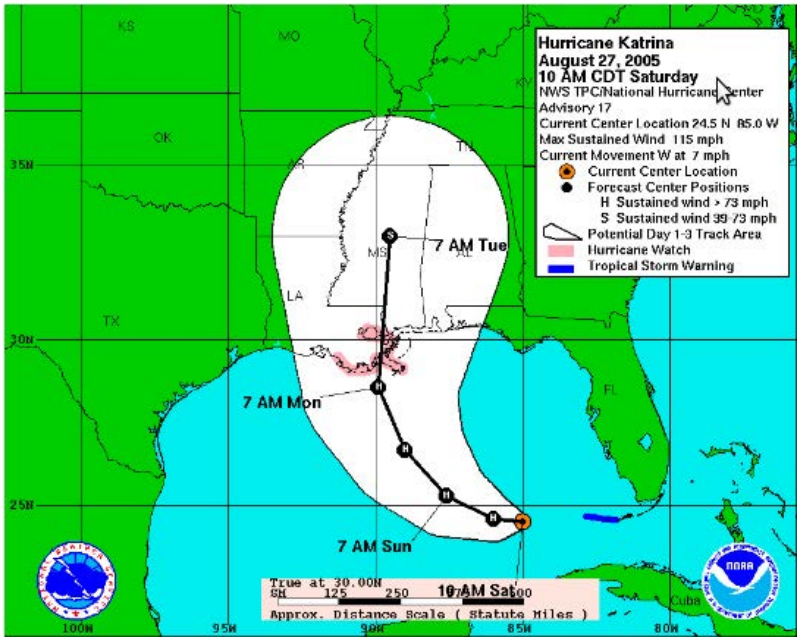
- Identifying information
- The identity and duration of the click/hold for each information element accessed.
- All questionnaire answers

Conclusion

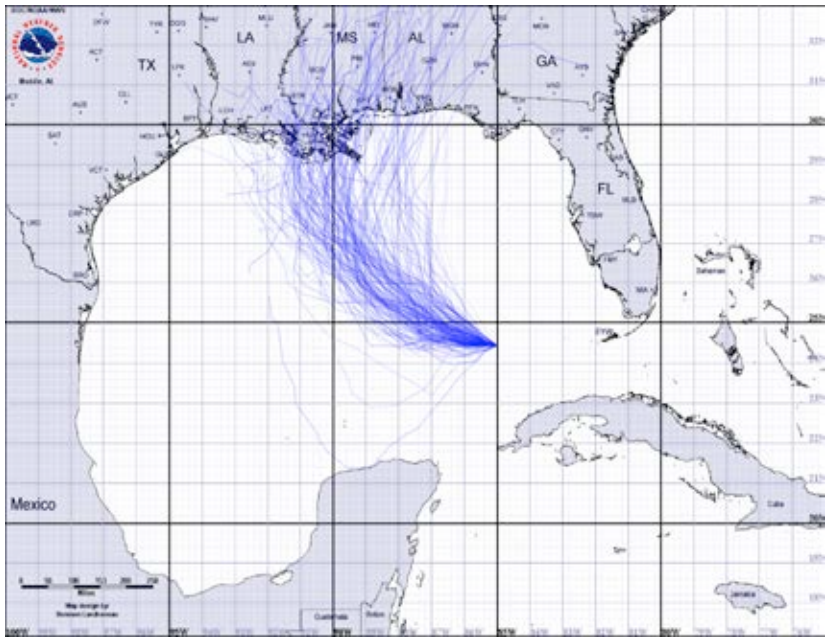
- *Dyna Search* will provide the framework for a series of experiments with large user populations.
- Web will allow administration across diverse subject pool.

Development of Enhanced Displays

Building a model of a predicted hurricane event

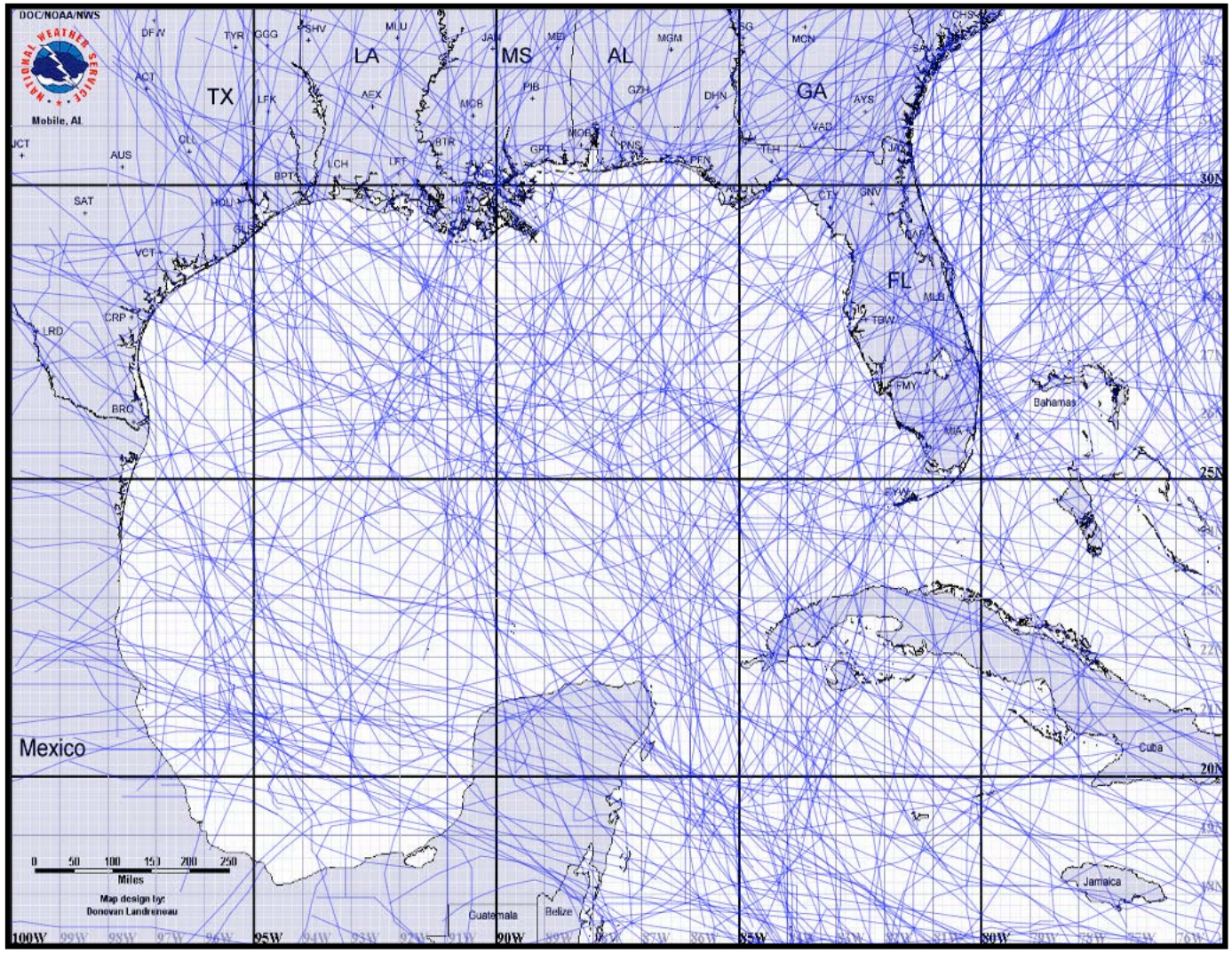


NHC error cone



Markov model track generation

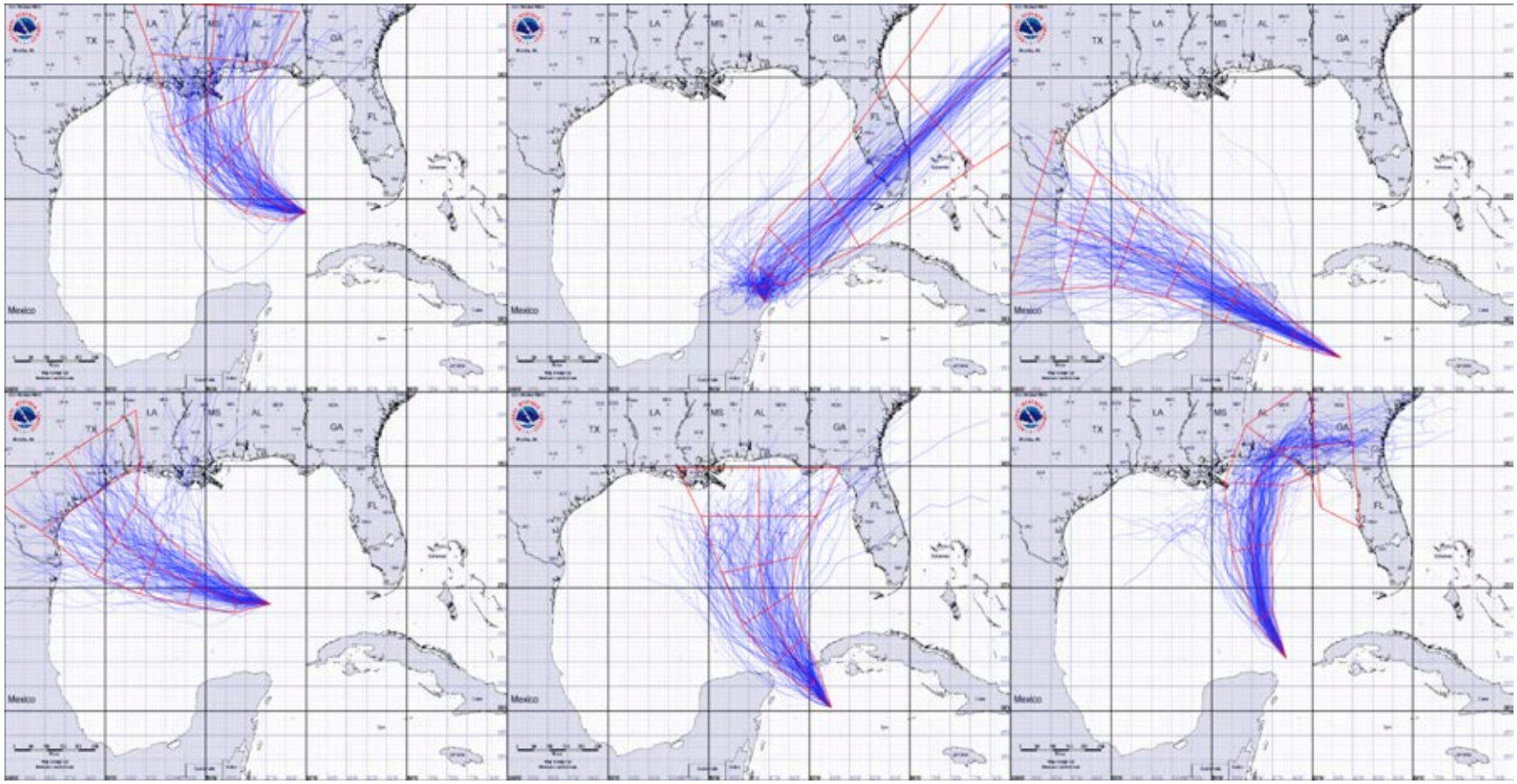
Historical track paths since 1945



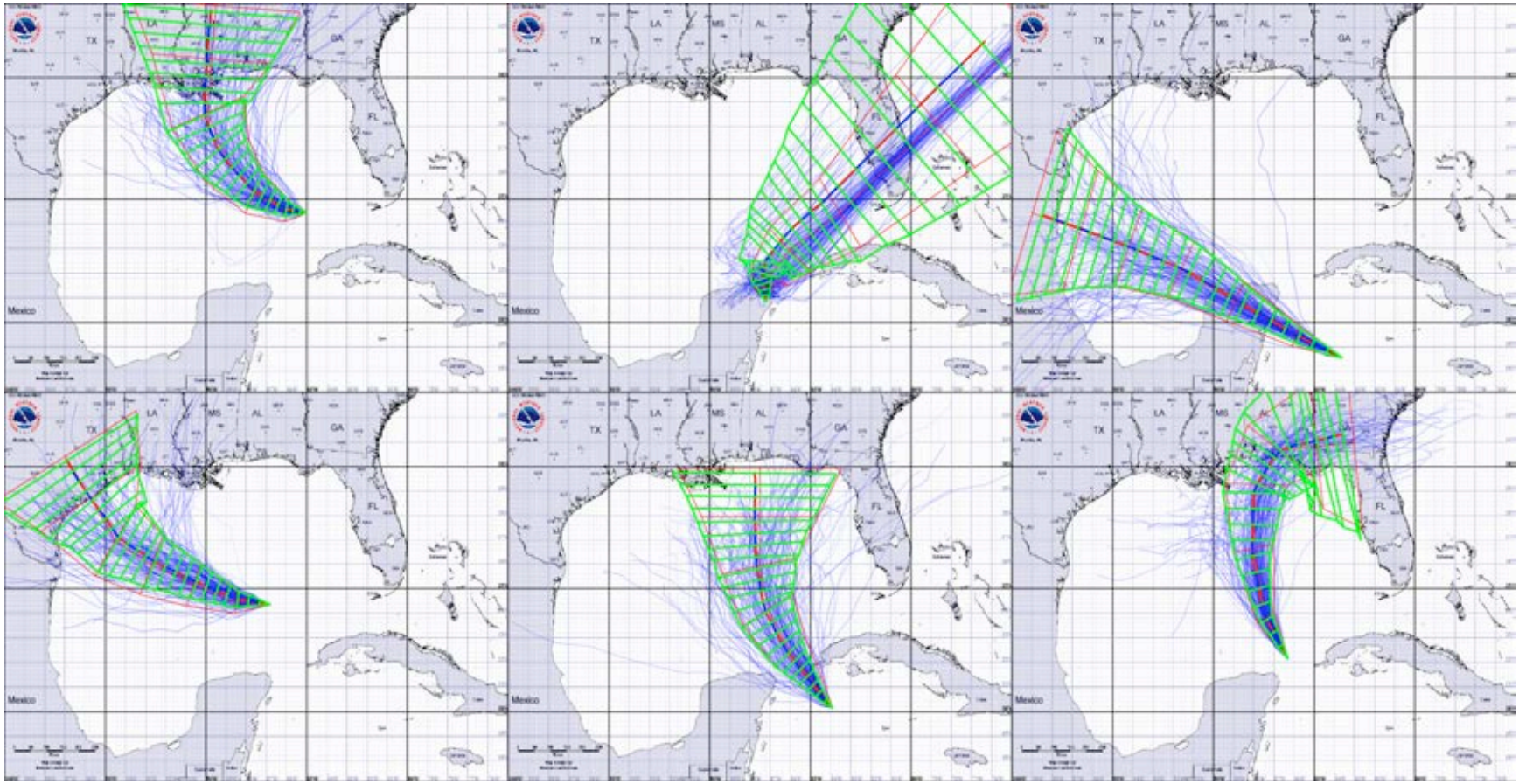
Our first model

- Paths grown in 3 hour time steps
- Retrieve a collection of nearby historical hurricanes at each step
- Probabilistically choose new speed and bearing from this collection
- Refine ensemble statistics with control system that modifies speed and bearing

Early track predictions for 6 hurricanes



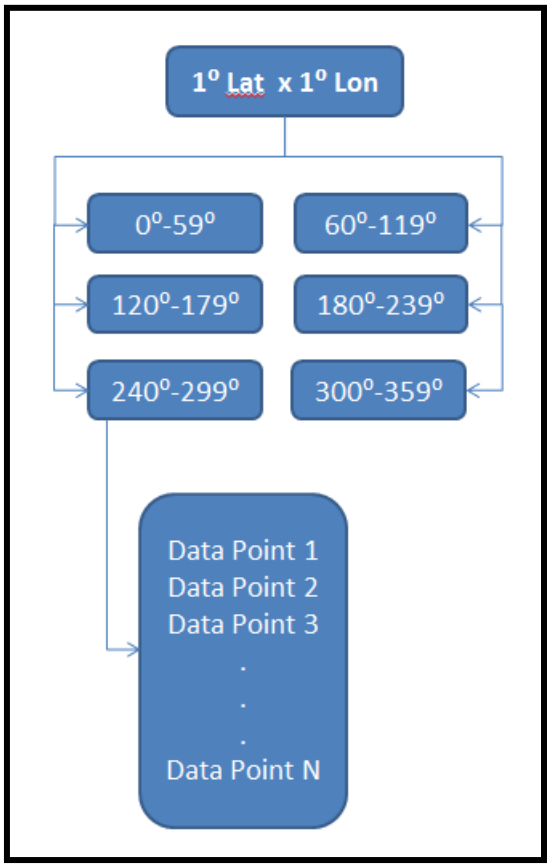
Early attempts to match with NHC prediction



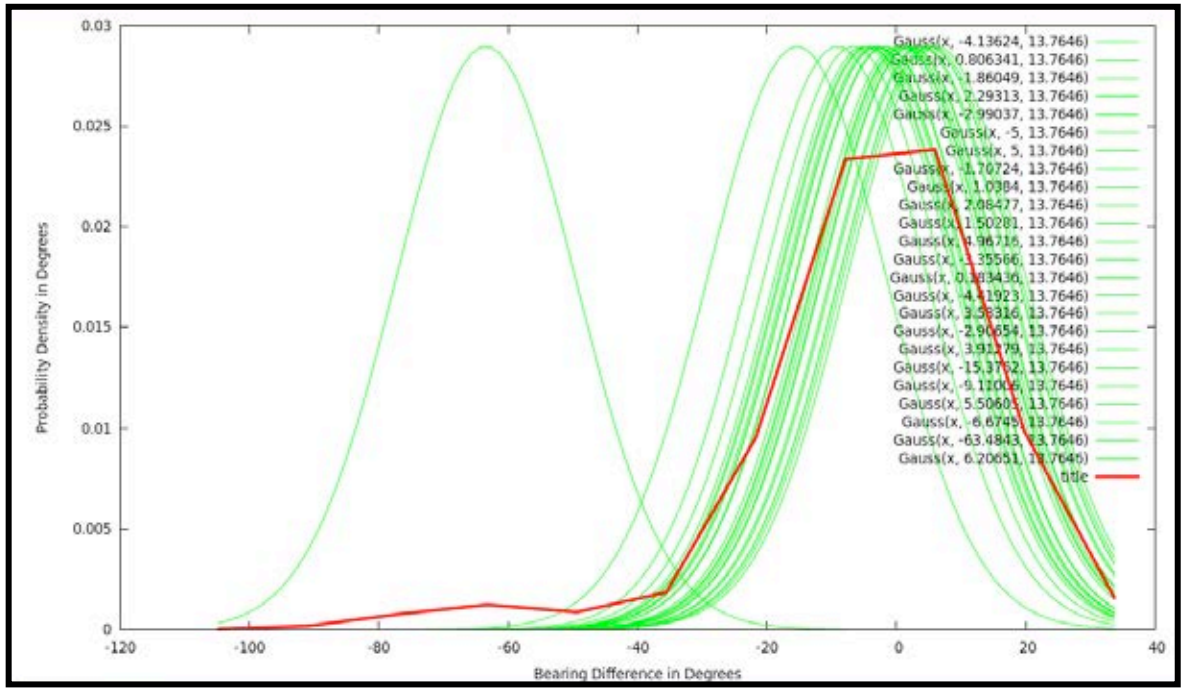
Our new model

- Build Markov random field over spatial grid
- Each cell provides PDF of exit speed and bearing given entry speed and bearing
- PDF's refined at each cell into 60 degree subcells
- New speed and bearing drawn from the local PDF weighted by predicted path

PDF estimation per 1° x 1° grid cell



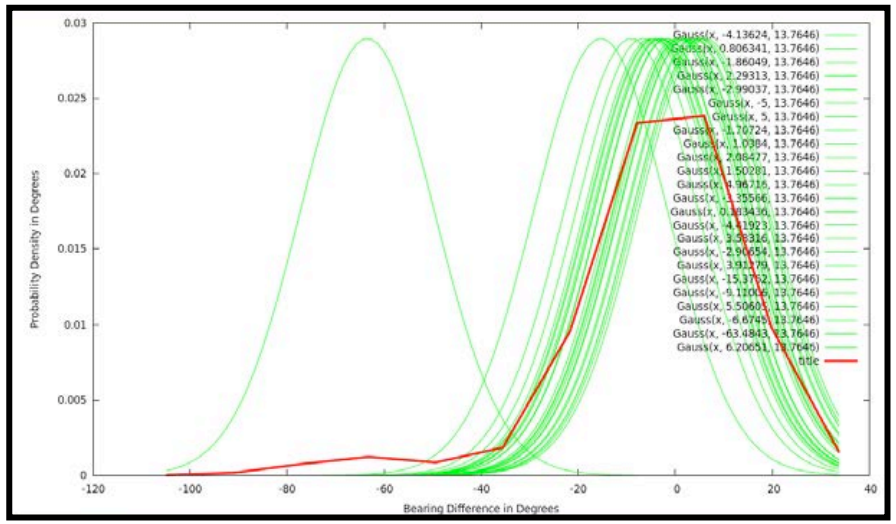
Data structure per cell



Kernel density estimator base on paths through cell

Predicted and historical PDF's combined

Grid cell PDF



(1 – w)

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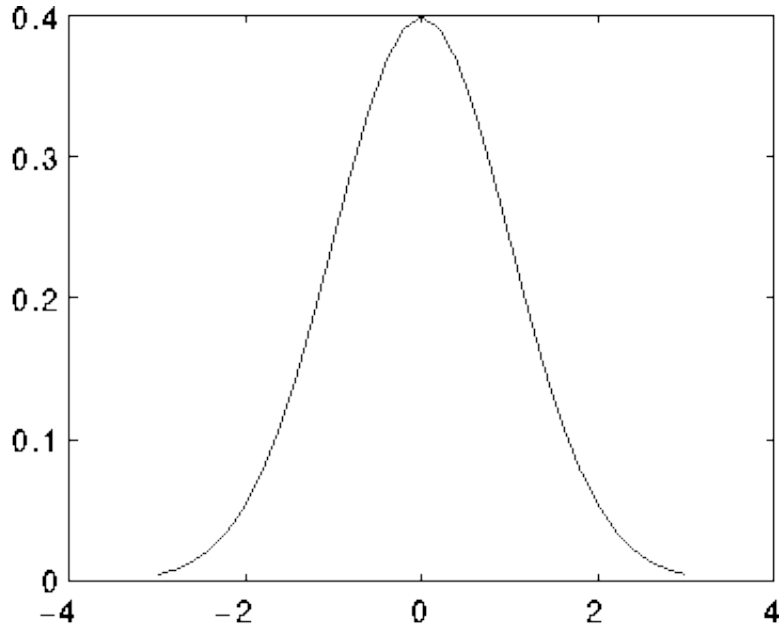
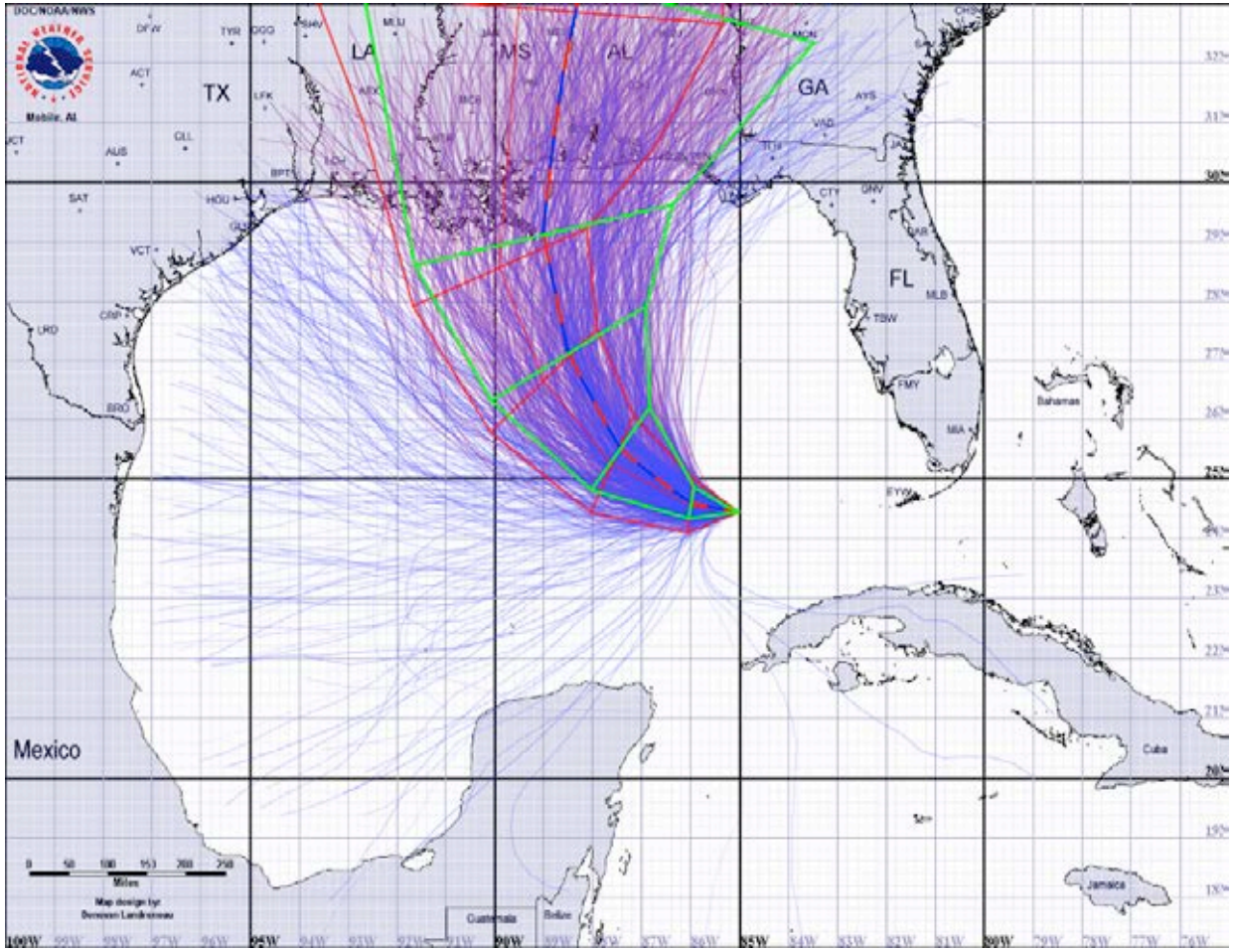
NHC prediction



w

New prediction model



An underlying probability field shown as a heat map

HurVis Demo

Conclusion

- We are close to having a sound model for generating predicted path ensembles.
- Ensembles reflect both historical data and NHC prediction.
- Should provide a sound basis for a number of specialized visualization tools.