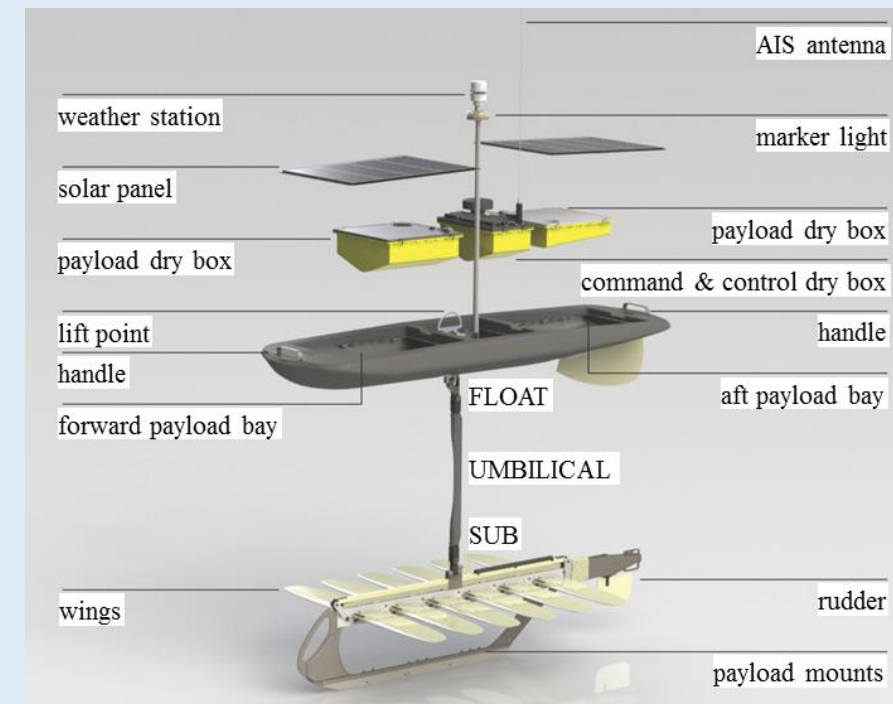


## Research, tools, and instruction related to ocean and atmosphere sciences

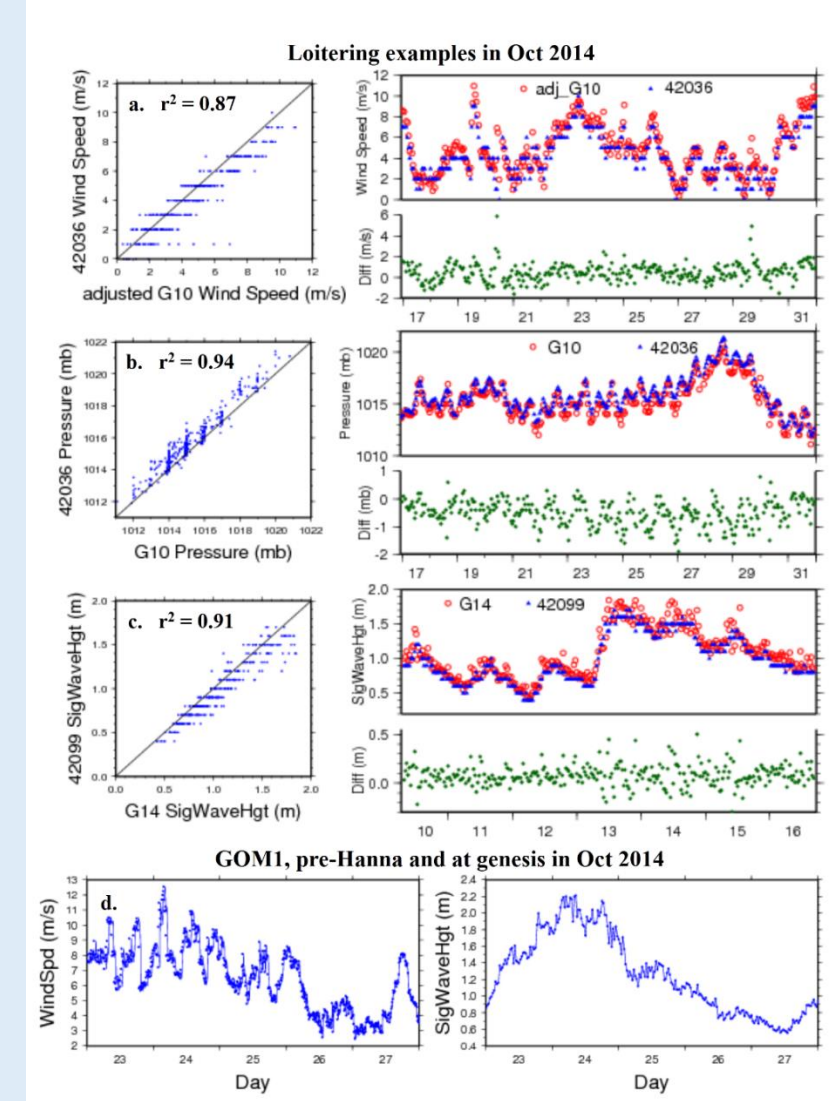
- Storm surge modeling with ADCIRC, SLOSH, and 1D model applied to operations, case studies, and return level assessment
- A tropical cyclone parametric scheme using storm structure information
- Ocean model validation scheme which blends multiple metrics
- Parallel coordinate tool with multiple regression developed in collaboration with NRL
- Ocean analysis of HWRF-POM and HWRF-HYCOM hurricane case studies
- The Wave Glider 2014 Gulf of Mexico Field program
- Oil spill simulation of Deepwater Horizon using AMSEAS
- A 1-km mesoscale atmospheric reanalysis field to force ROM simulations along the AL/MS/LA coast for CONCORDE field programs
- A new GUI which processes TAO data for NDBC operations
- Online instruction – <http://weatherclasses.com> and <http://distance.msstate.edu/geosciences>

## Field Work



### Loitering periods

- G10**
- 42040: 8/28-8/29
  - 42039: 9/2-9/5
  - 42036: 9/15-9/23; 10/11-11/21
  - 42099: 11/28-11/29
- G11 (renamed G14 on 9/11)**
- 42040: 9/1-9/5
- G12 (discontinued 10/24, duties assumed by GOM1)**
- 42039: 9/1-9/2
  - 84W, 26N: 9/9-10/23
- G14**
- 42040: 9/14-9/19
  - 42099: 10/10-10/21
  - \*Hanna\* 83.5W 25.1N: 10/25-11/18
  - 42099: 11/28-11/29
- GOM1**
- 84N, 26W: 10/14-10/21
  - \*Hanna\* 83.8W 24.9N: 10/23-10/31
  - \*Hanna\* 83.5W 24.9N: 11/1-11/3
  - 42099: 11/9-11/29

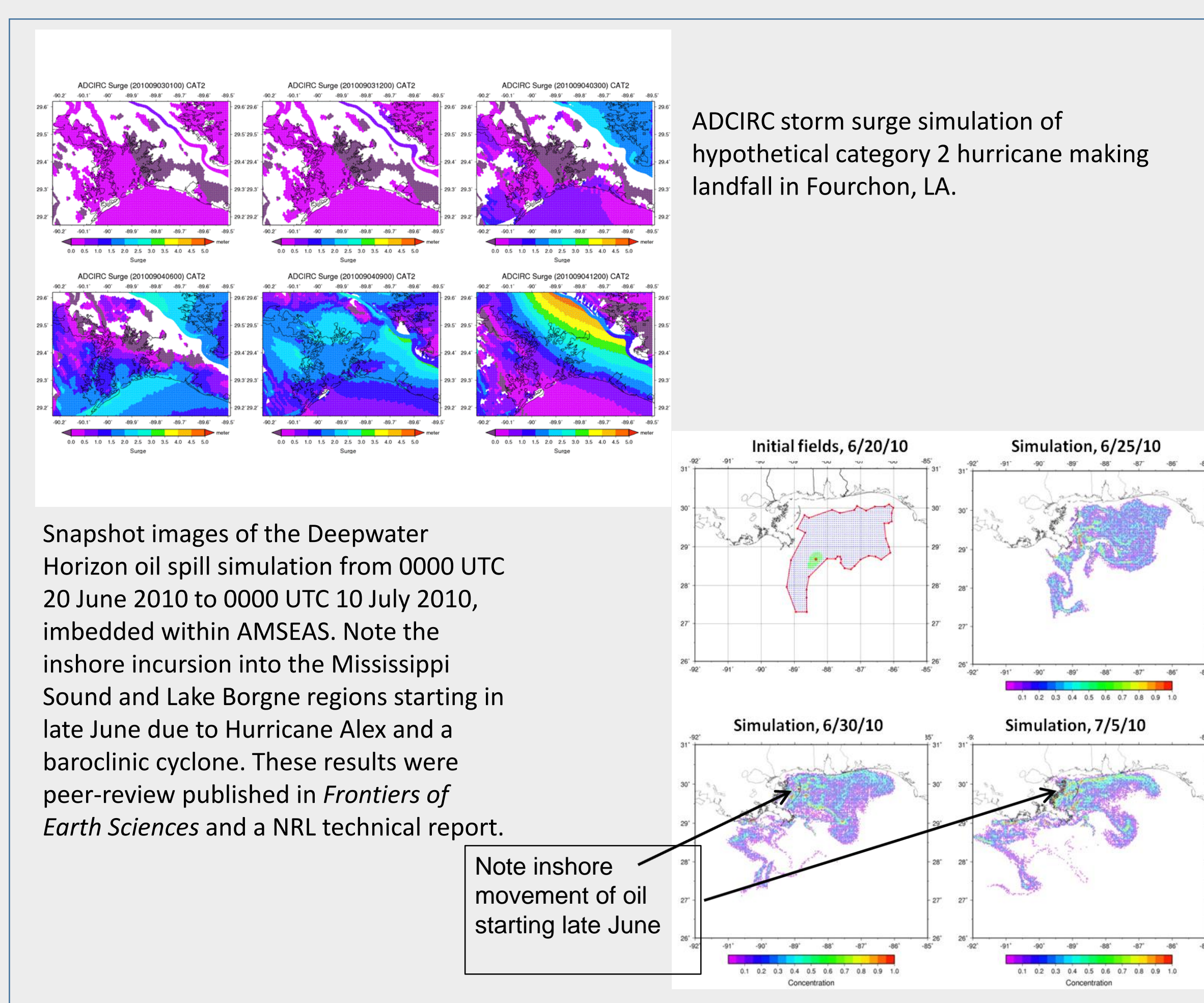
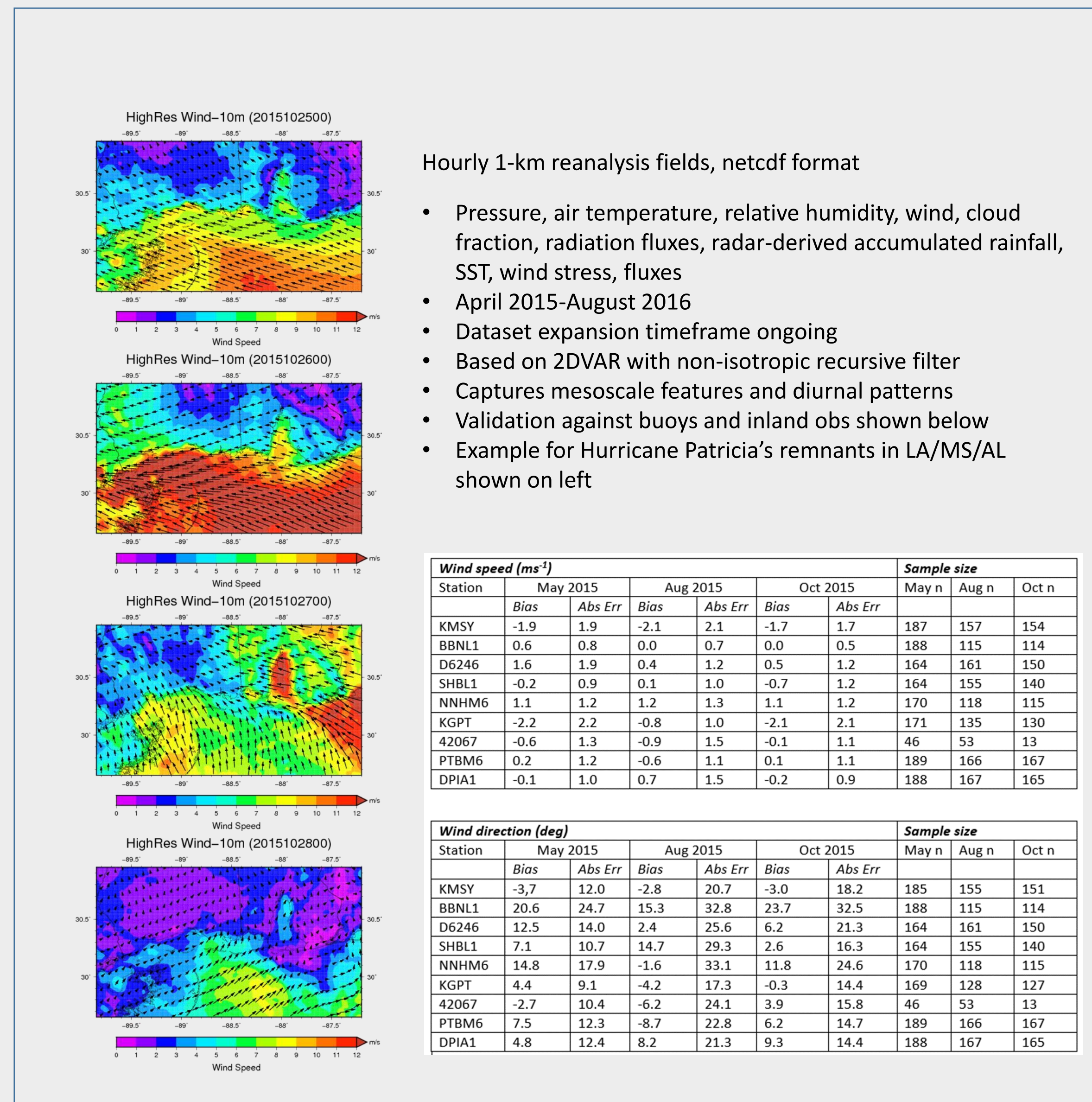


Deployments, buoy loitering, validation, tropical cyclone data, publications in MTS journal

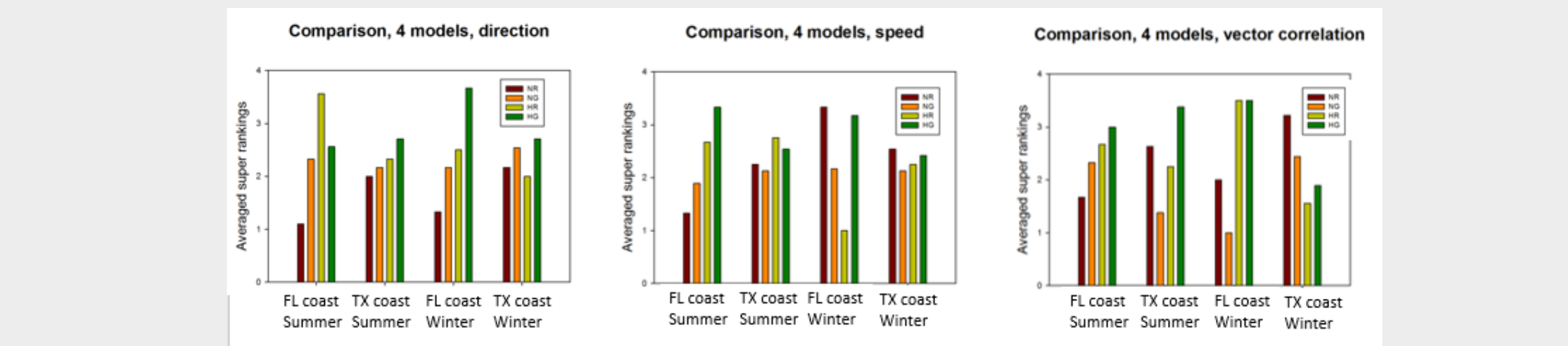
## Online/remote meteorology classes

Dr. Pat Fitzpatrick  
Dr. Kathy Sherman-Morris

## Modeling



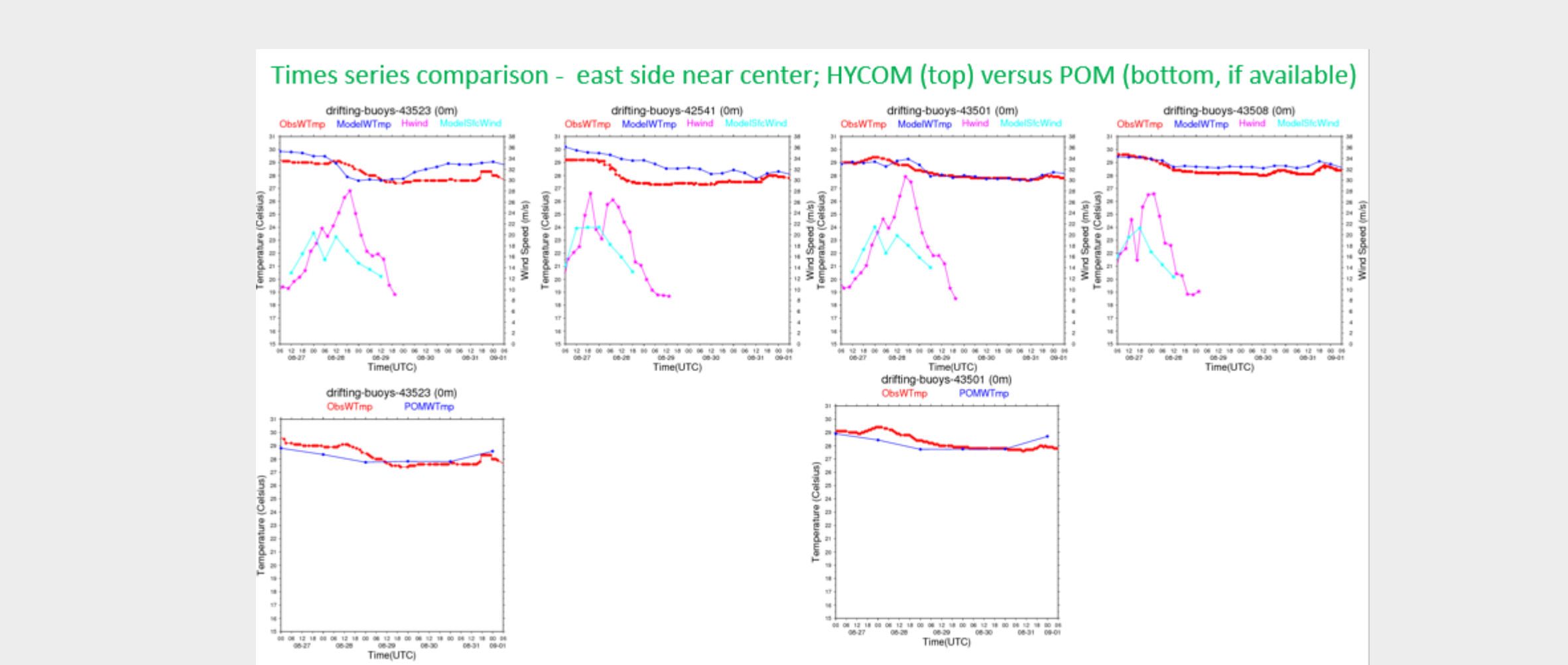
Snapshot images of the Deepwater Horizon oil spill simulation from 0000 UTC 20 June 2010 to 0000 UTC 10 July 2010, imbedded within AMSEAS. Note the inshore intrusion into the Mississippi Sound and Lake Borgne regions starting in late June due to Hurricane Alex and a baroclinic cyclone. These results were peer-reviewed published in *Frontiers of Earth Sciences* and a NRL technical report.



Validation of NCOM Regional, NCOM Global, HYCOM Regional, and HYCOM Global by MSU's Super-raking technique. This is a blend of 17 metrics with the following methodology:

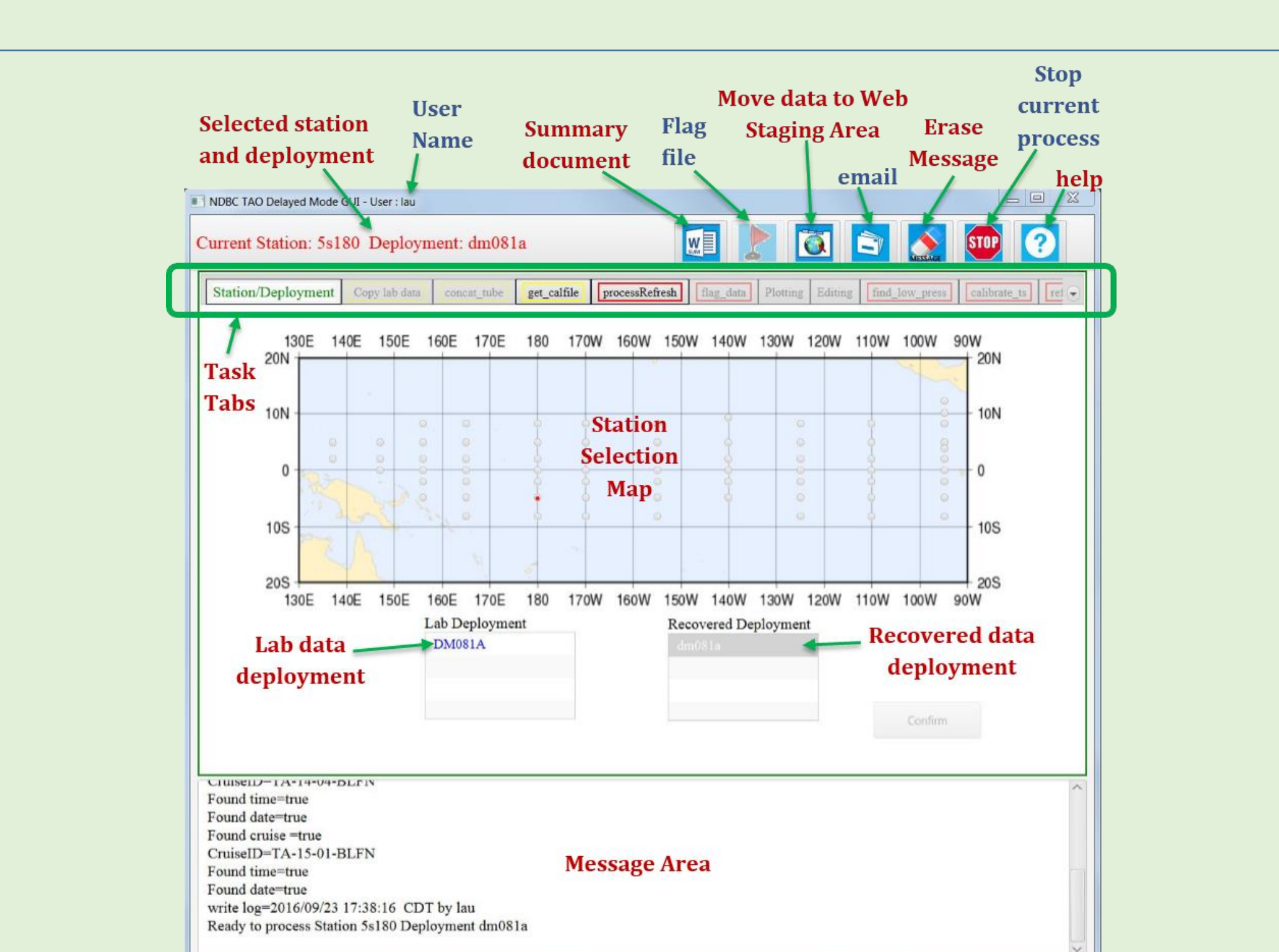
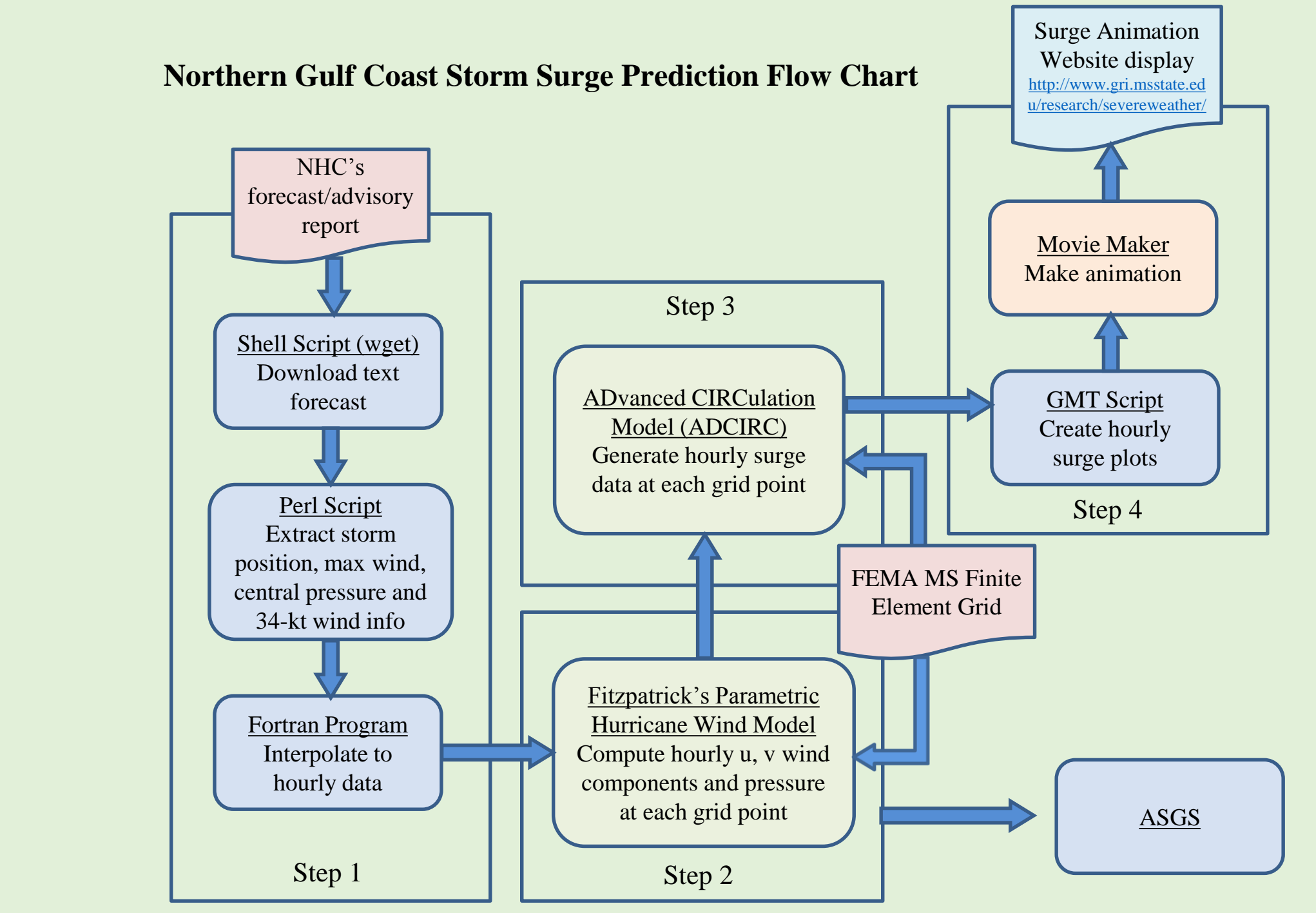
- Step 1: After every variable of each metric is calculated for the models at each observation per month, a **monthly variable rank** is given to each model (1 to 4 for four models, for example) with rank 1 being the best.
- Step 2: Assigning each monthly variable rank with points (0 pt for last place, 1 pt for 2<sup>nd</sup>-last, etc.), the sum of points for all months in the season determines the **seasonal variable rank** of each model at each observation.
- Step 3: For each seasonal variable rank in each metric, points again are assigned as in Step 2. The sum of points for all seasonal variable(s) in the metric determines the overall **seasonal metric rank** of each model at each observation.
- Step 4: To determine the final super-ranking of each model, averaging applied. The best model has the smallest averaged season model rank number.

Metrics include: absolute error percentage, six types of outlier metrics, model efficiency factor, Pearson correlation coefficient, Spearman correlation coefficient, Kendall's Tau, reliability index, multiplicative bias, normalized dispersion, normalized bias, root mean squared error, and root centered mean square difference. Vector correlation is also assessed.

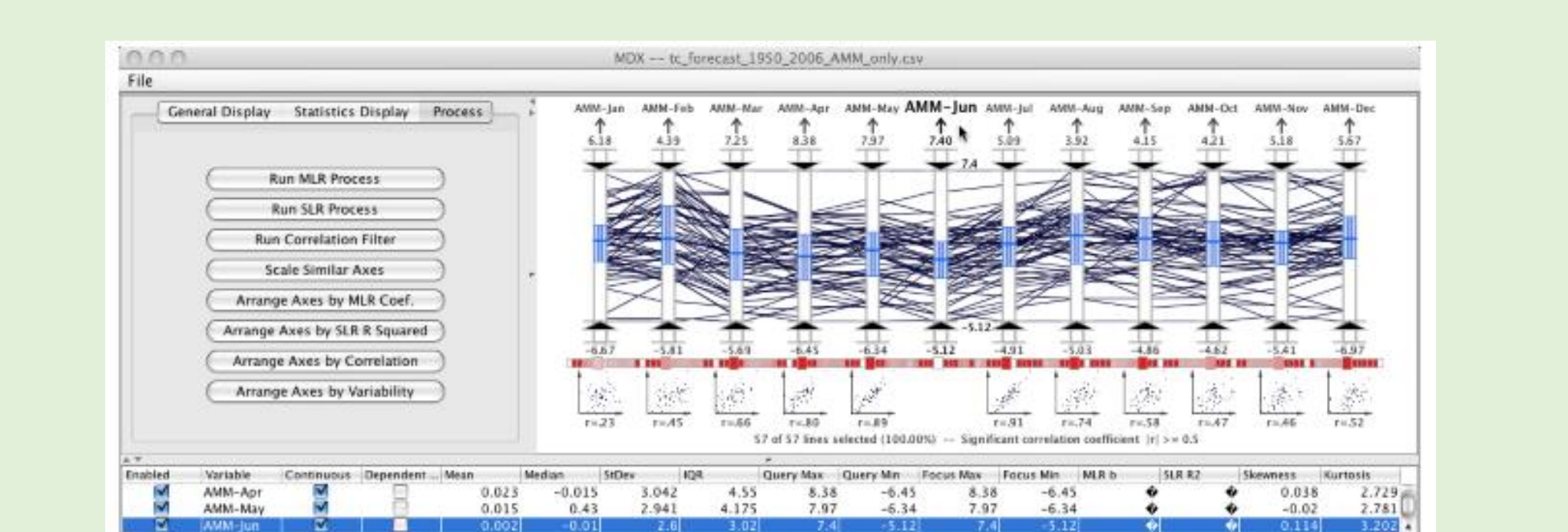


Analysis of HWRF-HYCOM and HWRF-POM coupling for Hurricanes Isaac (2012) and Edouard (2014) in collaboration with NOAA EMC and NOAA HRD.

## Algorithms & Software Applications



A new Java GUI interface (TaoGUI) has been developed which incorporates a customizable front-end seamlessly with existing TAO delayed-mode data processing programs. Only minor changes were done to the NDBC legacy programs. It connects to a NDBC MySQL database; creates data directories and transfers data; concatenates tube data; gets required metadata & data calibration files; creates processing event logs; converts and concatenates data; trims data; previews time-series data graphically; provides edit and quality-control edit data; flags data; calculates derived data; saves and exports data and metadata; calculates estimated data file sizes; retrieves start and end time from deployment, recovery, and repair logs; matches subsurface sensor property types with existing sensor files; constructs user settings to minimize user input time; and passes input to PERL and MATLAB scripts



A parallel coordinates interface with multiple regression applications. Three peer-review publications and a NRL technical report includes details. Patent number 8346682 issued on 1/1/13 for "Information Assisted Visual Interface, System, and Method for Identifying and Quantifying Multivariate Associations". Patent holders: C. A. Steed, P. J. Fitzpatrick, T. J. Jankun-Kelly, and J. E. Swan.