

A Review of MSU Software Tools and Research Applied to Ocean - Atmosphere Applications

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Abstract: The MSU program has actively participated in ocean-atmosphere research since 2001, with specialties in tropical cyclones, storm surge, and mesoscale meteorology. With NOAA funding through a Cooperative Institute, we interact with hurricane researchers at the AOML Hurricane Research Division, National Hurricane Center, and the Environmental Modeling Center. We provide high-resolution reanalysis packages in a GoMRI consortium to understand oil spill interactions in the river plume environment of Louisiana, Mississippi, and Alabama. As a byproduct, the research software tools have resulted in commercial products for WXWORX and Barons, as well as specialized services of hurricane forecasting and storm surge simulations. An overview of the online teaching website is discussed.

1. Introduction

The Northern Gulf Coast is dually threatened by weather hazards (tropical cyclones and severe weather) and ocean hazards (storm surge and oil spills). As a member of the NOAA Northern Gulf Institute (NGI), coastal hazards are one of the three core research issues. NGI integrates research across land-sea and the ocean-atmosphere interfaces using a combination of analyses, ecosystem modeling, and Earth-system modeling. The transition of NOAA research to application is also a metric of success, and commercialization has been ongoing since a NASA spin-up initiative occurred 20 years ago. We will briefly list these activities, with references at the end for those wishing to learn more. A poster with more information will be provided at the conference.

2. Objective

This abstract provides an overview of the MSU research program, developed software tools, commercial endeavors, and website information.

3. Materials and Methods

Research activity overlaps all means to synthesize science and education in the ocean and atmospheric sciences, which includes: 1) Statistical analysis and tools; 2) Atmospheric, wave, and storm surge modeling; 3) Validation of forecast products; 4) case study analysis; 5) Field programs; and 6) a Teaching website.

4. Result and Discussion

Below is a list of recent research activities, software tools, and websites. Please visit our poster for more information.

- Storm surge modeling suite (ADCIRC, SLOSH, PACSURGE) for operations, case studies, and return level assessments.
- A probability distribution function model for hurricane precipitation forecasts or hindcasts
- Tropical cyclone wind model using NHC storm structure information
- Multi-metric validation algorithm of forecast products. An example for NOAA hurricane forecast products is shown on the poster.
- Parallel coordinate tool with multiple regression.
- Analysis of HWRF hurricane case studies
- The Wave Glider 2014 Gulf of Mexico Field program

- Oil spill simulations of the Deepwater Horizon incident using AMSEAS ocean model
- 1-km mesoscale atmospheric dataset (CMA) for ocean model forcing
- Java GUI which processes TAO data for NDBC operations
- Peer-review papers are available on the websites. Third edition of hurricane reference book will be released in 2019

Websites are available for the following:

- Online instruction – <http://weatherclasses.com>
- Research – <http://drfitz.net>
- Commercial – <http://worldwindsinc.com>

5. Conclusions

MSU and WorldWinds, Inc. are interested in collaborations for research, commercial applications, and proposal authorship. Feel free to contact Pat Fitzpatrick for more inquiries.

6. Acknowledgments

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7. References

Please see drfitz.net for access to the following papers and presentations:

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