

User Perspective: Using OSCER for a Real-Time Ensemble Forecasting Experiment...and other projects

Currently:

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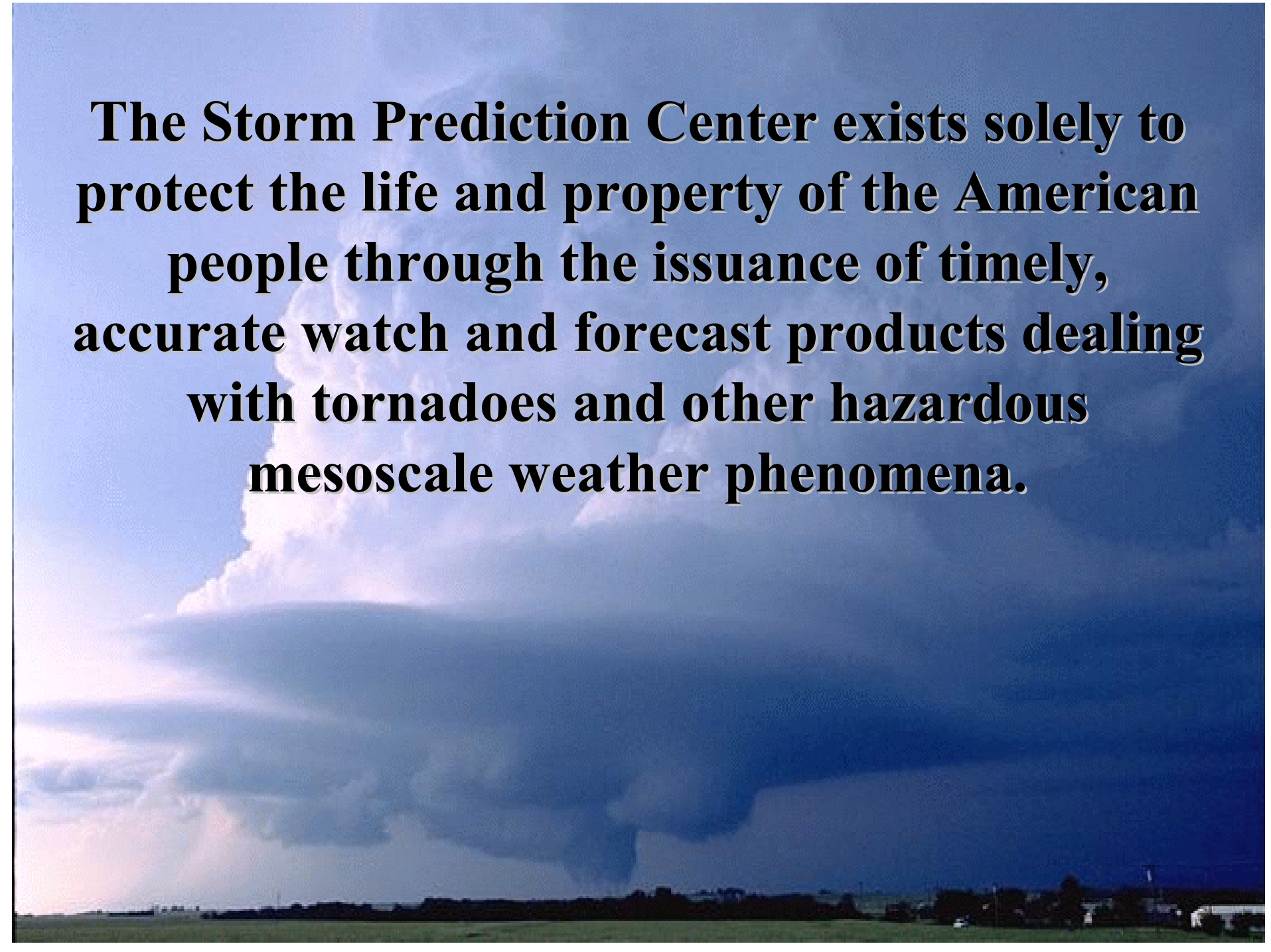
October 20th:

Jason J. Levit

**Techniques Development Meteorologist
Science Support Branch, NOAA Storm Prediction Center**



The Storm Prediction Center exists solely to protect the life and property of the American people through the issuance of timely, accurate watch and forecast products dealing with tornadoes and other hazardous mesoscale weather phenomena.



Science Support Branch Vision

To provide SPC forecasters with exceptional cost-effective computer systems, software, data, techniques and knowledge for operations and science infusion.



SPC/NSSL Spring Program

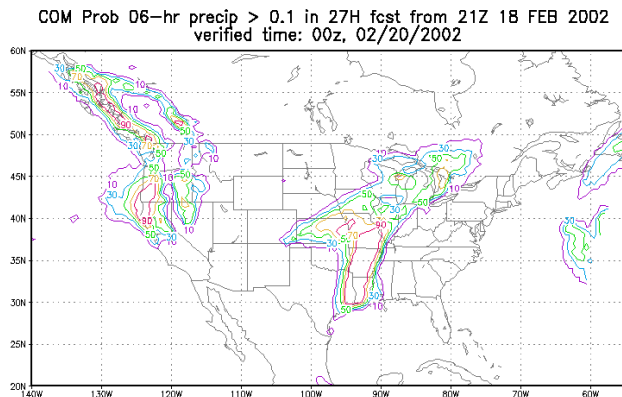
PRIMARY GOAL

To fulfill the goals of the National Weather Service strategic plan, by facilitating collaboration between operations and research, in an effort to advance severe weather forecast technology and provide improved products to customers

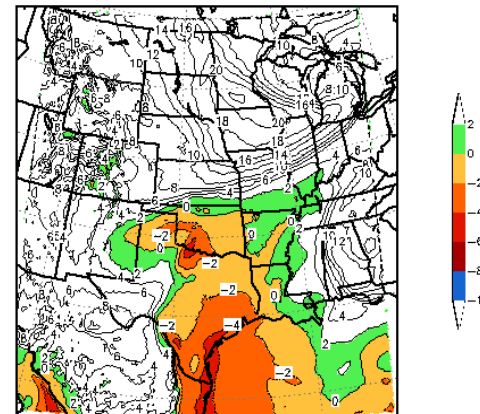


SPC/NSSL Spring Program

- The 2003 Spring Program ran from Apr 14-Jun 6, 2003
 - Explore Use of Short-Range Ensemble Systems in Operational Severe Weather Forecasting
 - Use ensemble data to create an experimental Day-2 severe weather outlook



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Project Idea for Spring 2003

- **Introduce ensemble numerical weather prediction forecasts to the SPC forecast staff**
- **Examine NCEP 15 member ensemble**
- **Use Stensrud software to have forecasters interactively create ensemble initial conditions**
- **Need a big ensemble: OSCER ideal**



OSCER's Role

- Use 32 “boomer” nodes each day, from 11:30-2:30 pm, Monday-Friday: created 32 ensembles
- MM5 software used the Intel FORTRAN compilers
- Special software created for queue submission, also used local scratch for intensive I/O
- Experiment ran nearly flawlessly



Ensemble Forecasting



*Usually it
takes more
than one
shot to get
it right!*



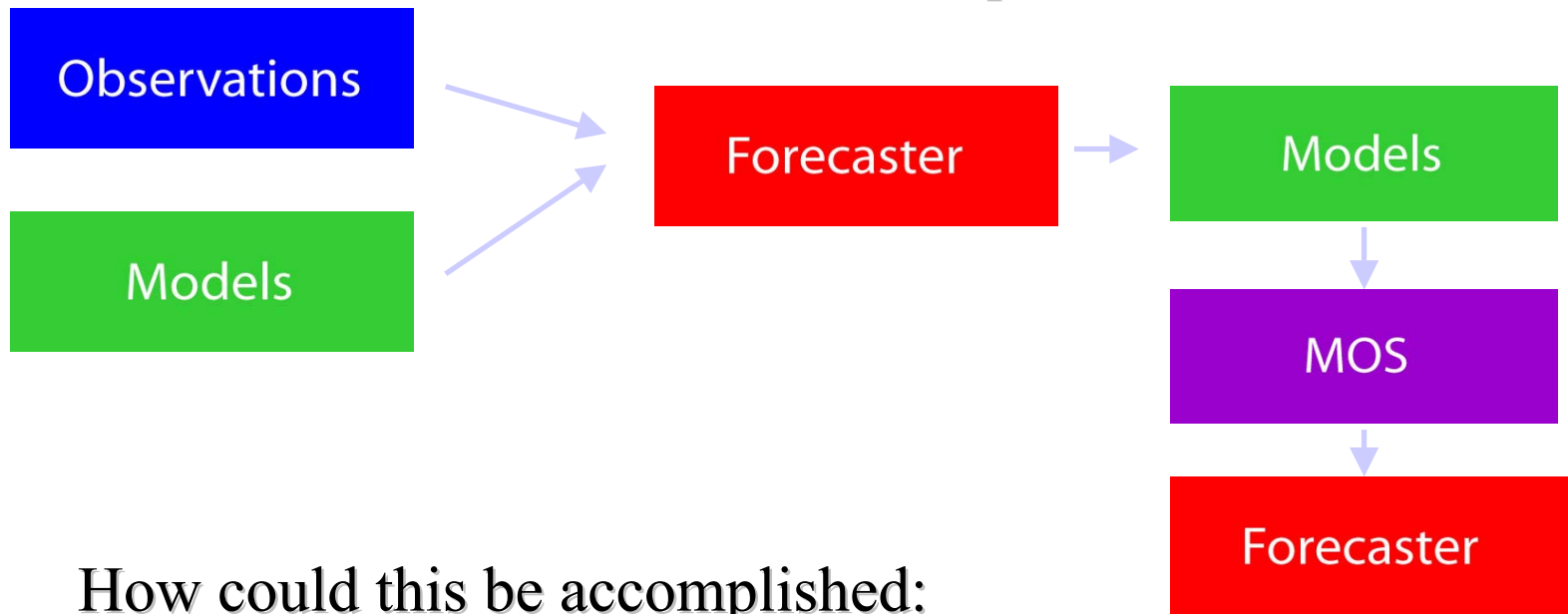
Severe Weather Forecasting

- How can we use ensemble output for short-range weather forecast activities?
- Provides possible outcomes and can highlight events that appear unlikely from observations
- Shows different possible evolutions and initiation regions of deep convection
- Identify regions that may be sensitive to model and initial condition uncertainty



Tomorrow's Forecast Process?

Forecaster interacts with models to create improved initial conditions



How could this be accomplished:
Use OSCER to generate ensembles

Better guidance to
public



Adjoint Approach

- Forecasters interact with control run output and determine areas of forecast importance (similar to day 1 outlook products)
- Pose questions from model output:
- How sensitive is forecast to low-level moisture in area of potential severe thunderstorm development?
- How sensitive is forecast to strength of short-wave trough?
- How sensitive is forecast to strength of moisture convergence?



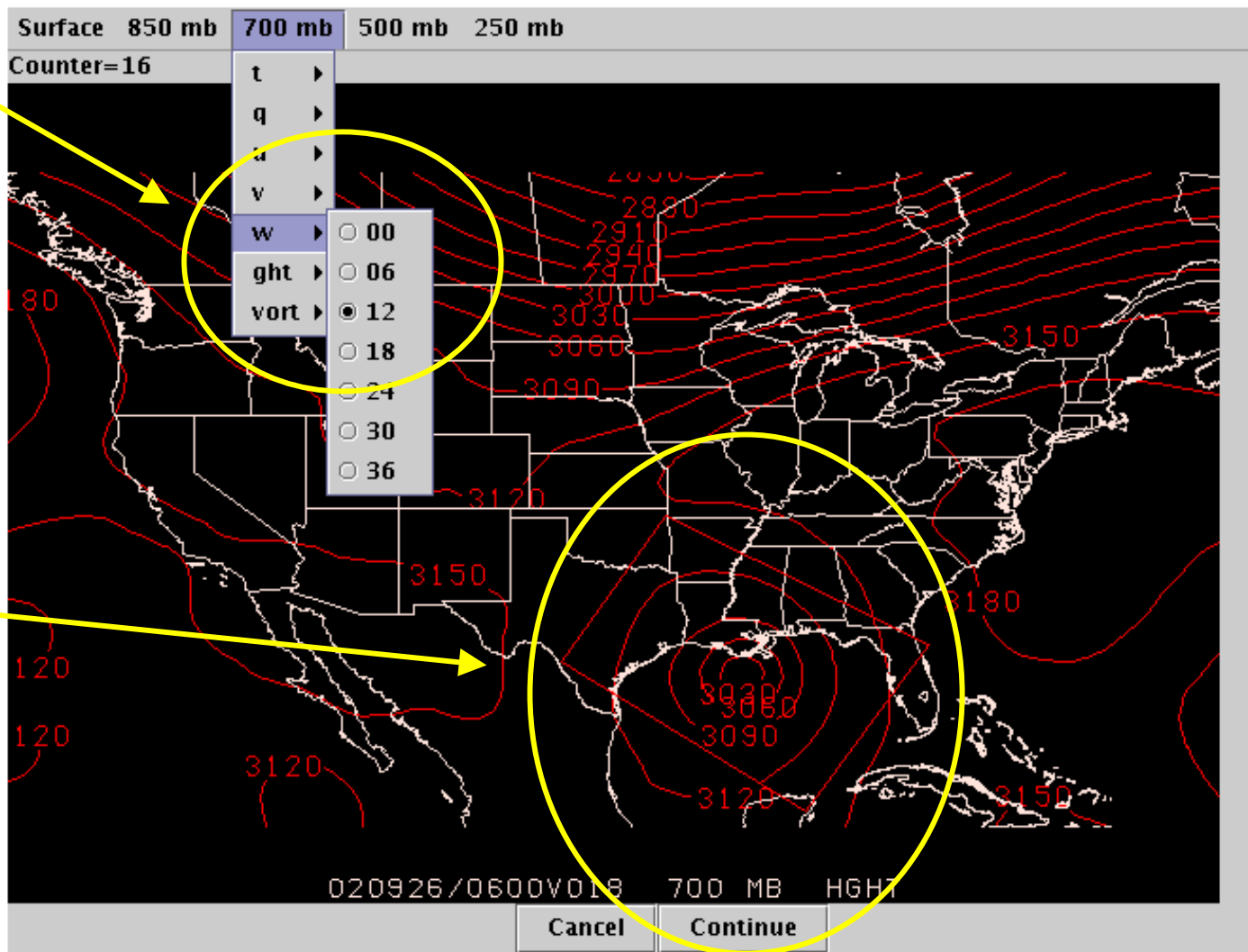
- These questions can then be used to create an ensemble using an adjoint version of the numerical model.
- Need to specify parameter of interest, and horizontal and vertical regions in which the sensitivity is to be examined.
- ***Direct link between forecaster and creation of ensemble for use in forecast process!***



Perturbation Generation

Forecaster chooses level, field, and time

A box is drawn around interest area, process continues until counter is at zero



OU Collaboration - OSCER



- **Proposal for computer time submitted in February 2003**
- **Local supercomputer center allowed us to refine project with OSCER staff, and test timings**
- **Example of the partnerships available within the Oklahoma Weather Center community**



Success with OSCER

- **Supercomputer was needed to create ensemble forecasts**
- **OSCER's "boomer" Linux cluster was ideal because of its close proximity**
- **Collaboration between scientists and OSCER staff was a phone call or short drive away**
- **OSCER staff created custom software**



OSCER Forges Partnerships

- **CAPS running daily 5-member ensemble, used towards end of program**
- **NSSL cluster used for post-processing of data for Spring Program**
- **SPC/NSSL computers used for forecaster analysis**
- **Partnerships created strong experiment**



Other Projects Using OSCER

- NSF “Advanced Weather Data Visualization” research grant – uses “boomer” to generate numerical model data for graphics research
- Tornado outbreak research: Re-run historical tornado outbreaks using a weather model, in an effort to understand weather patterns before major tornado outbreaks



Advanced Weather Data Visualization



Riley, Ebert, Hansen, Levit



OSCER is a Cornerstone

- **Our research work would not exist without OSCER**
- **OSCER facilities are supporting groundbreaking weather research in a number of areas**
- **Support staff is excellent**
- **Major opportunities for continued research**



NWS Storm Prediction Center
www.spc.noaa.gov

