

GIS Frameworks in the National Weather Service

Eugene Derner

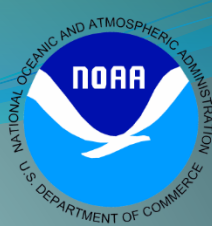
Senior Hydrologist

NOAA/National Weather Service

Missouri Basin River Forecast Center



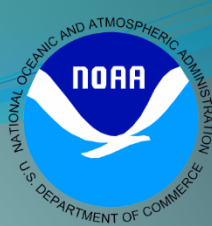
Agenda



- GIS Brief History
- In-house GIS
- Weather GIS Applications
- Hydrology GIS Applications



History

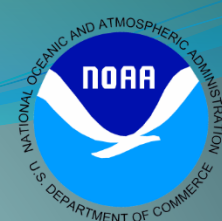


- AFOS
- Circa early 1980's
- Simple vector graphics
- Monochrome

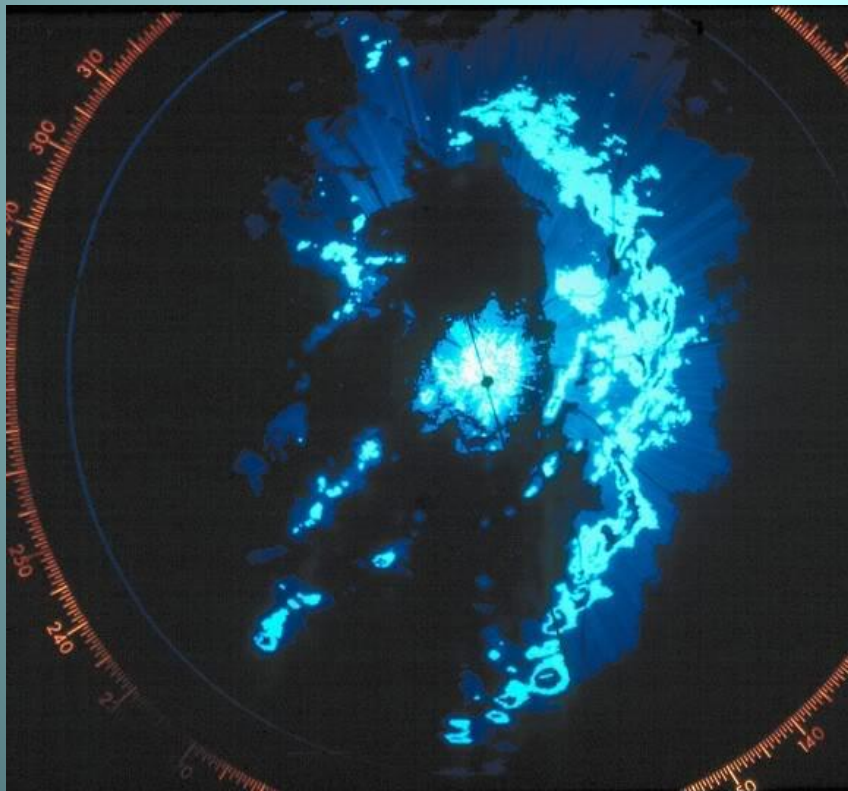




History

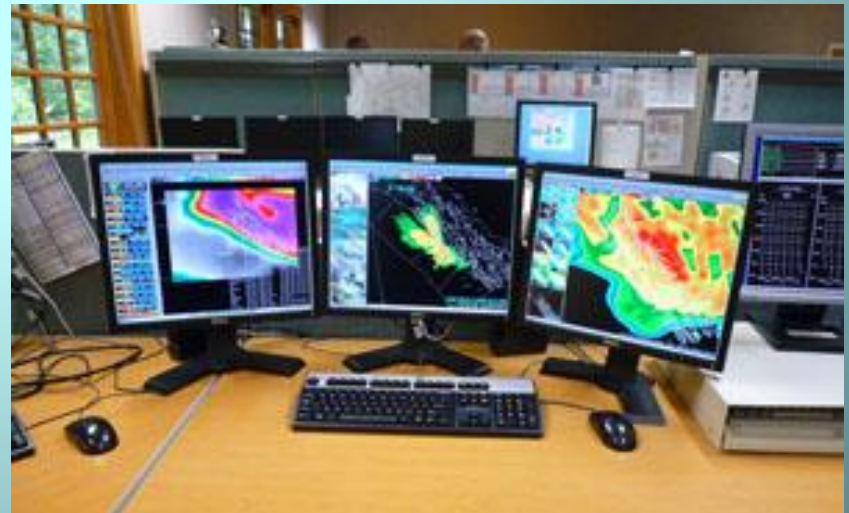
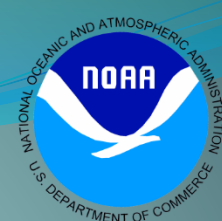


- Early generation radar
- 50's and 60s technology
- Hand digitized to national grid using paper and wax pencil





History ... Leap Forward to Today





In-house GIS



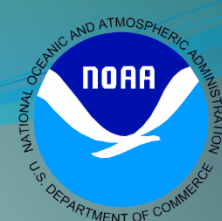
- Why in-house GIS and not COTS such as ESRI?

Modernization took place in the 1990s

- Early ad-hoc weather visualization software developed by academia and NWS on UNIX.
- Lack of robust commercial GIS based on NWS needs.
- Conglomeration of software pieces lead towards UNIX adaption.



In-house GIS



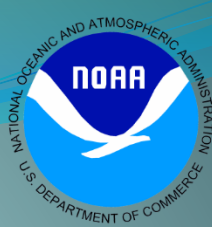
Needs / Capabilities

- Ingest huge datasets from a variety of sources.
- Backroom geoprocessing done automatically.
- Ability to plot and overlay a multitude of datasets.
- Data is time-synched.
- New data automatically ingested and displayed.
- Easy to use!!

Let the forecaster focus on forecasting and severe weather.



Weather GIS Applications



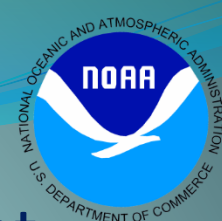
Two major GIS application packages:

CAVE – Common AWIPS Visualization Environment

GFE – Gridded Forecast Editor



Weather GIS Applications



CAVE – Common AWIPS Visualization Environment

The screenshot displays the CAVE software interface. At the top, a menu bar includes options like 'File', 'View', 'Options', 'Tools', 'Volume', 'Obs', 'NCEP/Hydro', 'Local', 'Upper Air', 'Satellite', 'koax', 'kuex', 'kdmx', 'kfsd', 'towi', 'Badar', 'SCAN', 'Maps', and 'Help'. Below the menu bar is a toolbar with icons for file operations and a 'WarnGen' button. The main display area is divided into several panes: a large 'Main Display Pane' showing a map of the United States, and several 'Smaller Monitor Panes (2 or 4)' on the left showing different map views. A 'Title Bar' is at the top of the window, and a 'CAVE Perspectives Tab Bar' is on the right. At the bottom, there is a 'System (Current) Time-Date' showing '15:22 Monday 02/07/11', a 'CAVE Time/date Frames Status Window' showing 'Frames: 1 Time: 22:51Z 10-Feb-11', and an 'AlertViz Status Bar' with a 'Request EDEX Product' button.

Panel

Smaller Monitor Panes (2 or 4)

Title Bar

Menu Bar

Toolbar

CAVE Perspectives Tab Bar

Main Display Pane

AlertViz Status Bar

Product Requested and Wait Indicator

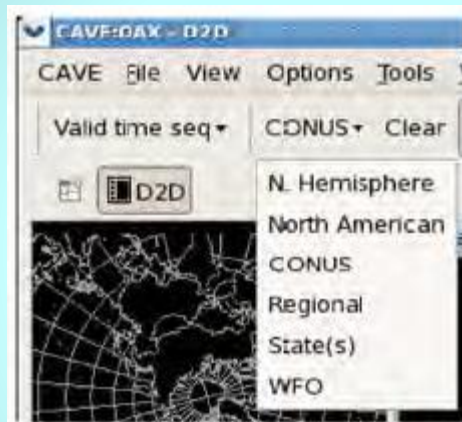
CAVE Time/date Frames Status Window

System (Current) Time-Date

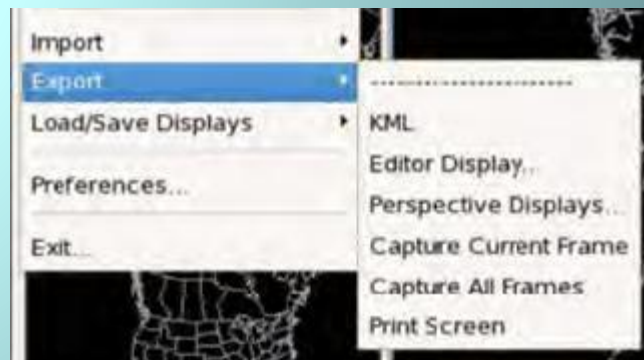
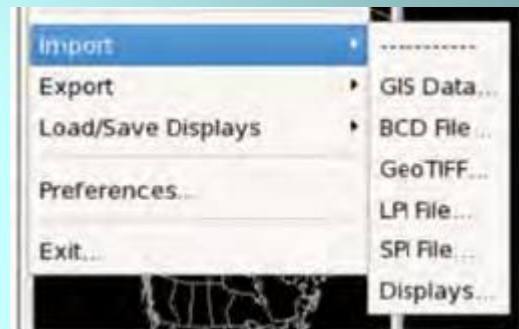
Product Navigation Via Menu



Predefined view scales



Import and Export

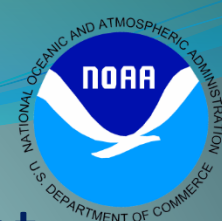


Custom Visualization





Weather GIS Applications



CAVE – Common AWIPS Visualization Environment

The screenshot displays the CAVE software interface. At the top, a menu bar includes options like 'File', 'View', 'Options', 'Tools', 'Volume', 'Obs', 'NCEP/Hydro', 'Local', 'Upper Air', 'Satellite', 'koax', 'kuex', 'kdmx', 'kfsd', 'towi', 'Badar', 'SCAN', 'Maps', and 'Help'. Below the menu bar is a toolbar with various icons for navigation and visualization. The main display area is divided into several panes: a large 'Main Display Pane' showing a map of the United States, and several 'Smaller Monitor Panes (2 or 4)' on the left side showing different map views. A 'Title Bar' is at the top of the window, and a 'Menu Bar' is below it. A 'Toolbar' is located below the menu bar. A 'CAVE Perspectives Tab Bar' is on the right side of the main display pane. At the bottom, there is an 'AlertViz Status Bar' and a 'Product Requested and Wait Indicator' showing 'Request EDEX Product'. The system time and date are displayed in the bottom left corner as '15:22 Monday 02/07/11'. The CAVE time/date and frames status window at the bottom right shows 'Frames: 1 Time: 22:51Z 10-Feb-11'.

Panel

Smaller Monitor Panes (2 or 4)

Title Bar

Menu Bar

Toolbar

CAVE Perspectives Tab Bar

Main Display Pane

AlertViz Status Bar

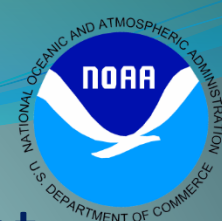
Product Requested and Wait Indicator

CAVE Time/date Frames Status Window

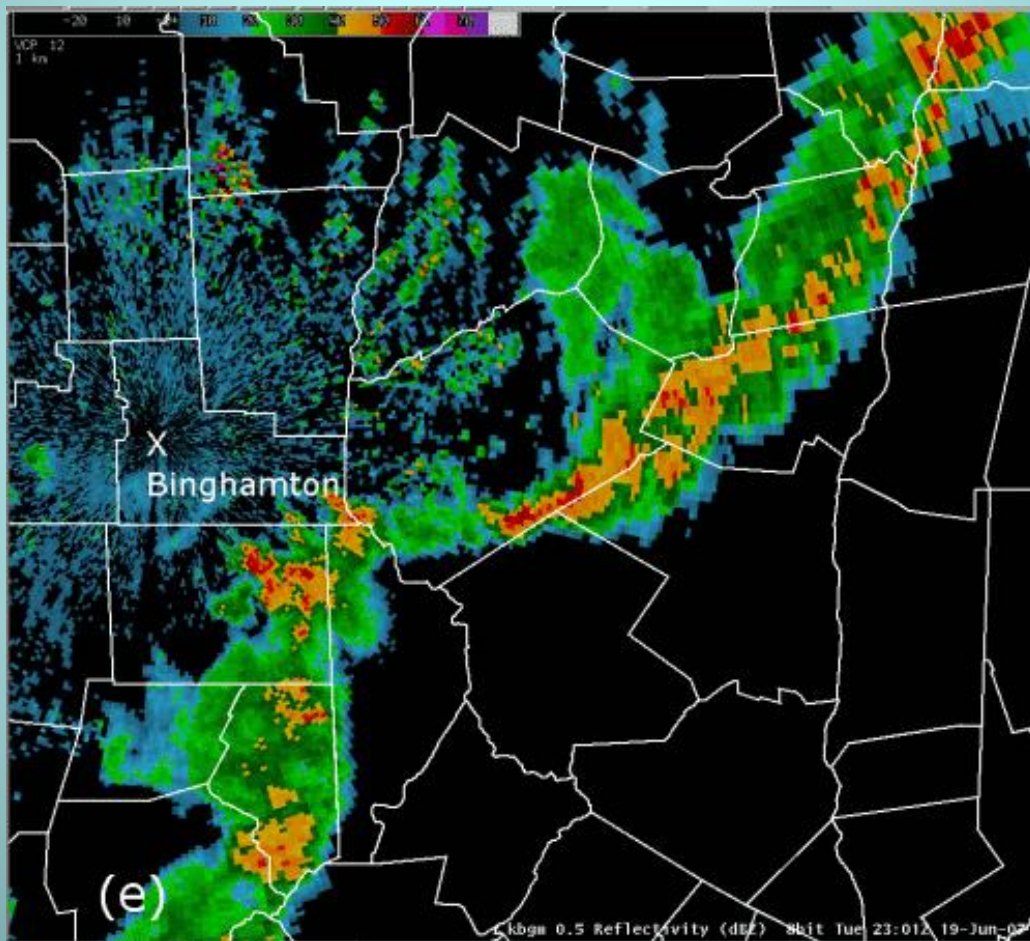
System (Current) Time-Date



Weather GIS Applications

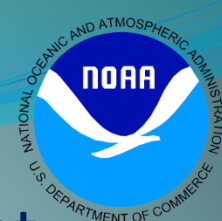


CAVE – Common AWIPS Visualization Environment

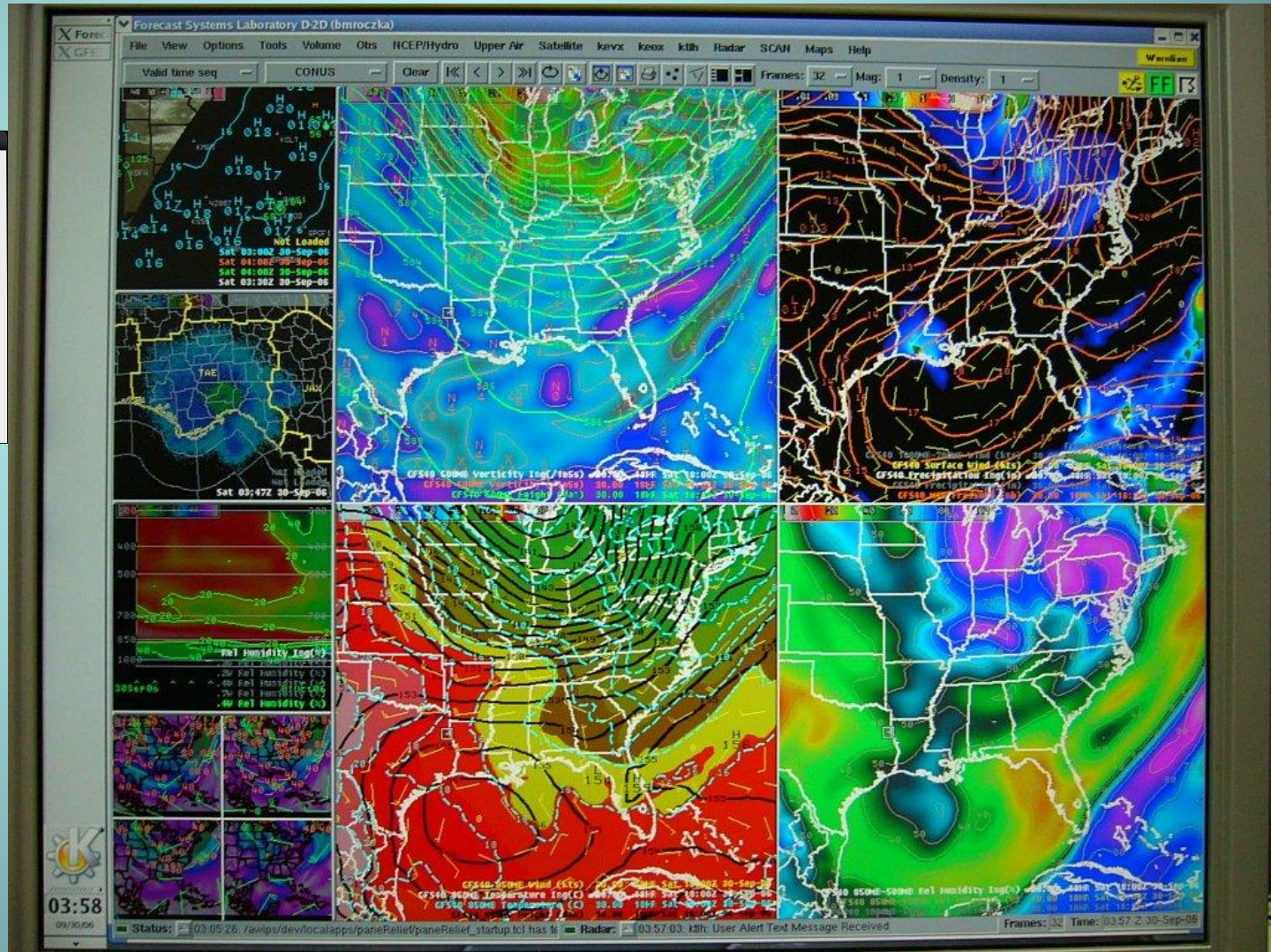




Weather GIS Applications

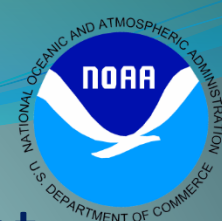


CAVE – Common AWIPS Visualization Environment





Weather GIS Applications

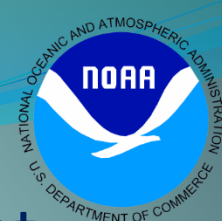


CAVE – Common AWIPS Visualization Environment





Weather GIS Applications



CAVE – Common AWIPS Visualization Environment

Forecast Systems Laboratory D-2D (swlll)

File View Options Tools Volume Obs NCEP/Hydro Local Upper Air Satellite Kftg tden thwi Radar SCAN MADIS Maps Help **WarnGen**

Valid time seq WFO Clear Frames: 12 Mag: 1 Density: 1

WarnGen: Operational

Backup Track type Edit
FSL One Storm
Line of Storms
Box
Track
Box and Track

Redraw Box on Screen from: Warned Area Visible:
Track Warned/Hatched Area Dam Break Threat Area

Product type
Flash Flood UPDATE LIST
Severe Thunderstorm
Tornado
Other: Extreme Wind Warning

Time range
Duration: 30 min
17:12 Thu 13-Aug to 17:42 Thu 13-Aug Change...

Optional bullets:
***** BASIS FOR WARNING (CHOOSE 1) *****
Doppler radar indicated
Trained spotters reported
public reported
local law enforcement reported
***** THREAT (CHOOSE up to 1 each wind/hail) *****
60 mph wind
70 mph wind
80 mph wind
Penny size hail
Nickel size hail
Quarter size hail
Golf ball size hail
Baseball size hail
pathcast???
***** CALLS TO ACTION (CHOOSE 1 OR MORE) *****

Instructions:
Adjust Centroid in any Frame
Adjust box around Warning Area

Create Text Restart Close

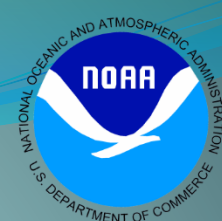
Interactive WarnGen (Editable) Thu 16:06Z 13-Aug-09
METAR Thu 16:00Z 13-Aug-09
5 Minute Lightning Plot Thu 16:00Z 13-Aug-09
0.5 Reflectivity (dbZ) Thu 16:06Z 13-Aug-09

Status: Radar: Frames: 12 Time: 17:12 Z 13-Aug-09

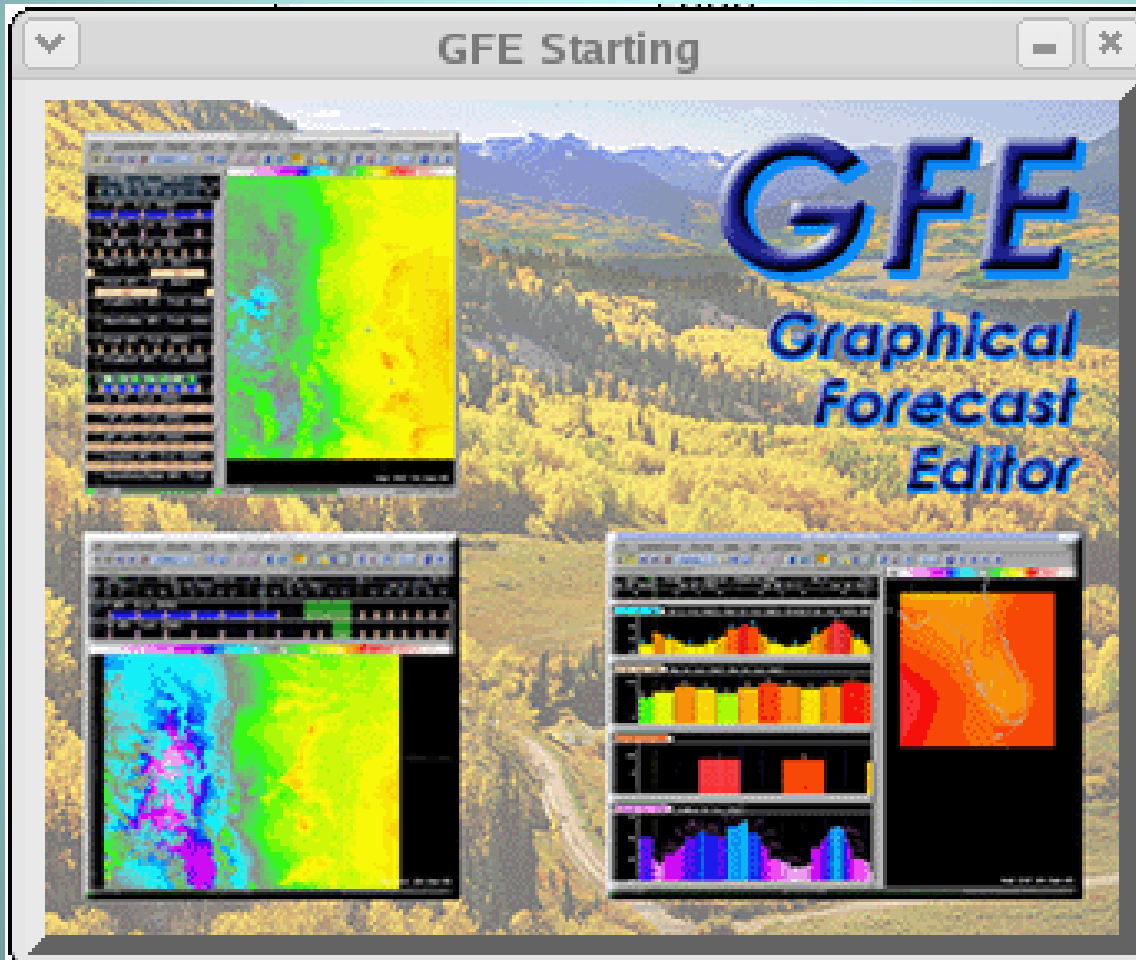




Weather GIS Applications

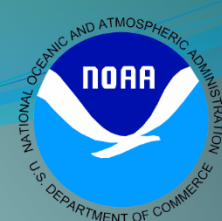


GFE – Graphical Forecast Editor





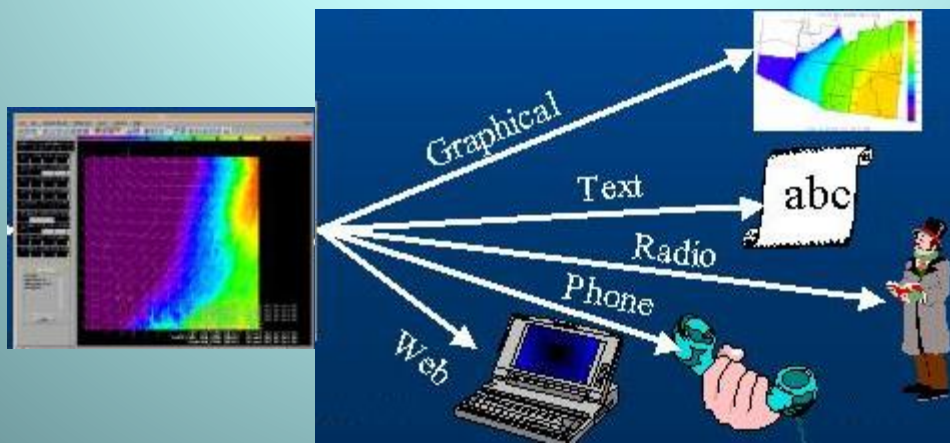
Weather GIS Applications



GFE – Graphical Forecast Editor

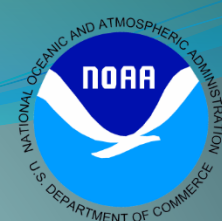
What is GFE?

- An graphical and visual method of producing forecasts in the NWS.
- Edit gridded weather elements with a “paint brush” approach temperature, wind, clouds, rain, snow, etc
- Gridded weather elements generate products at the push of a button.





Weather GIS Applications



GFE – Graphical Forecast Editor

Spatial Weather Editor

Select Points Tool



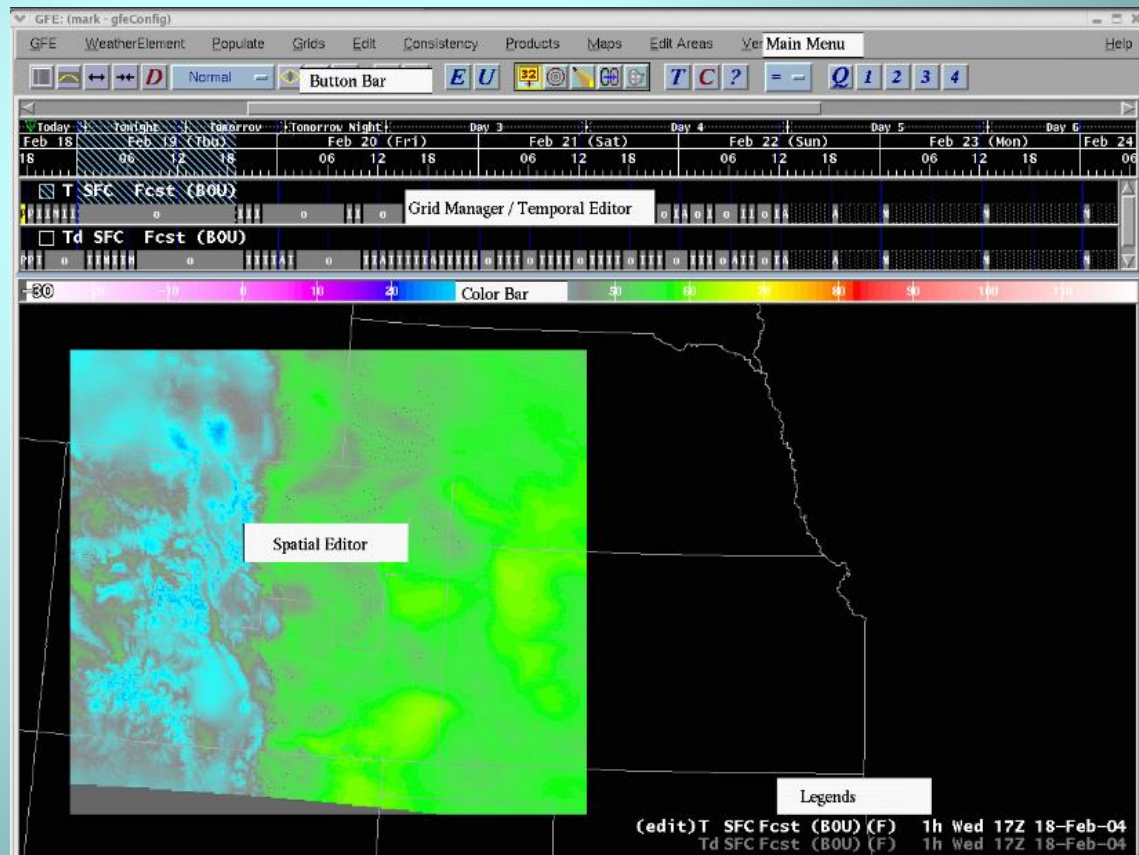
Contour Tool



Pencil Tool

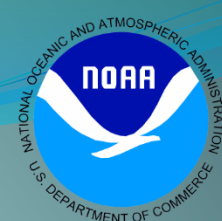


Move/Copy Tool



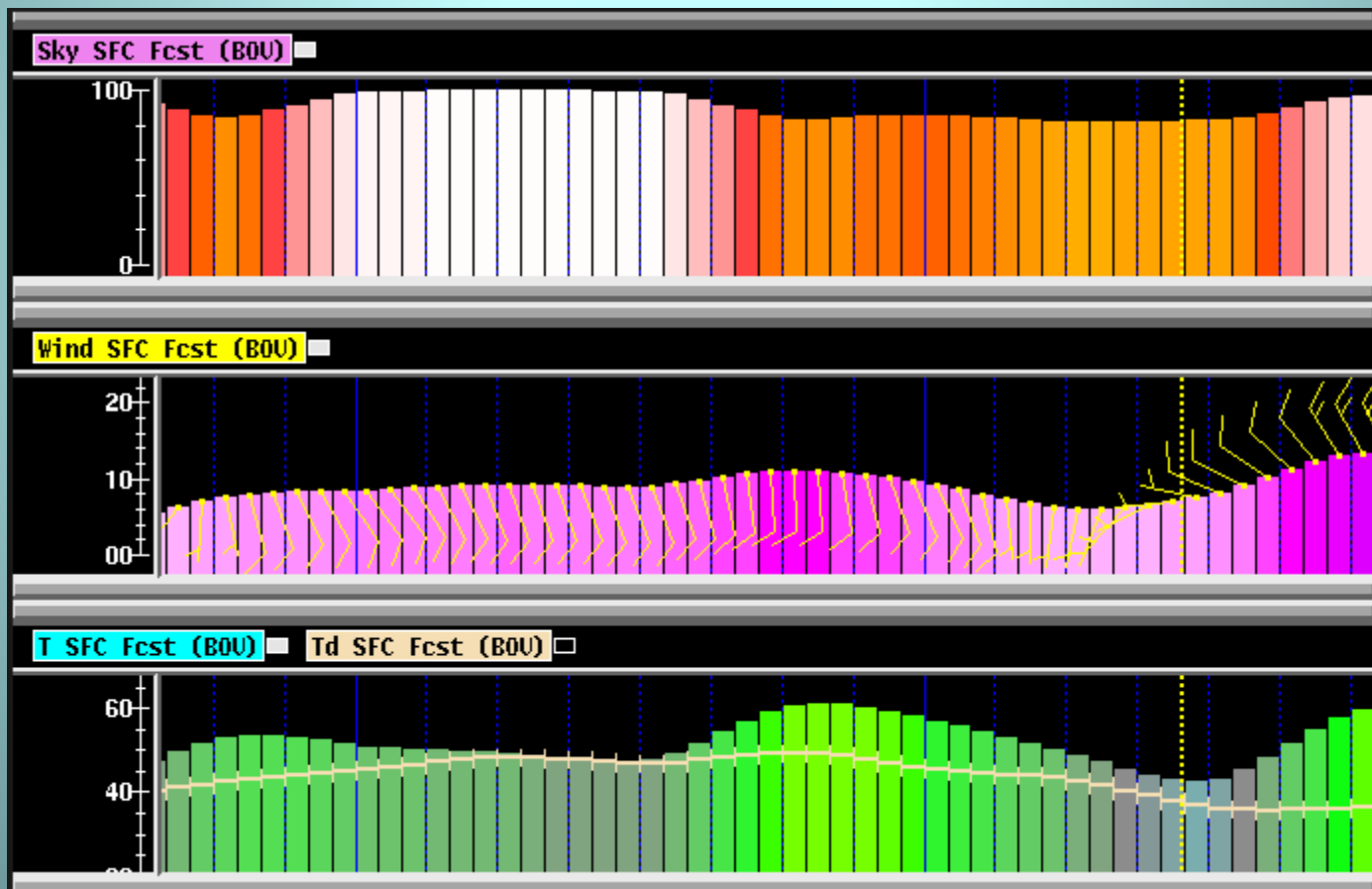


Weather GIS Applications



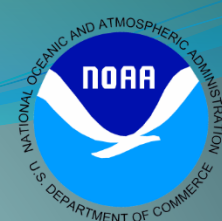
GFE – Graphical Forecast Editor

Temporal Weather Editor



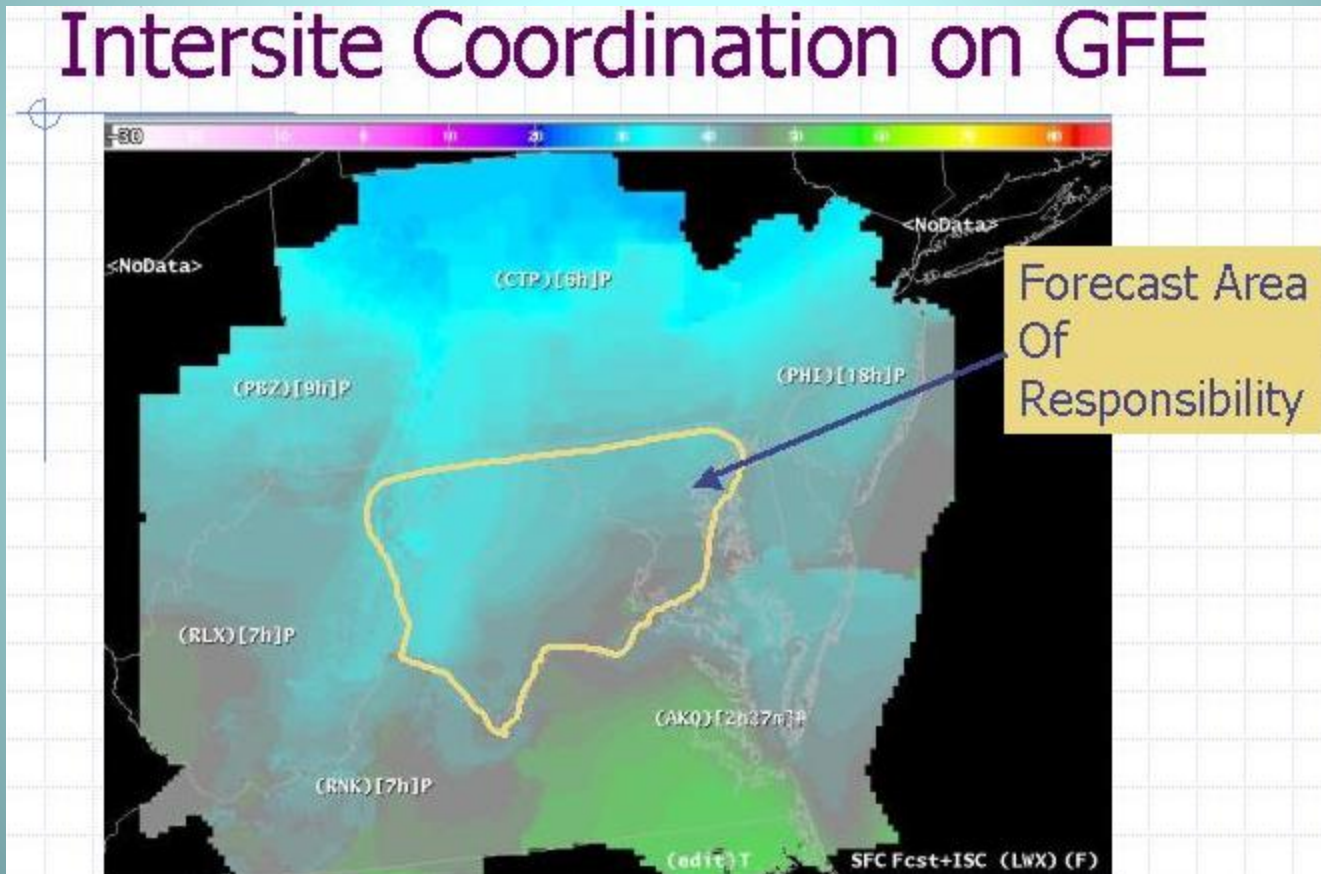


Weather GIS Applications



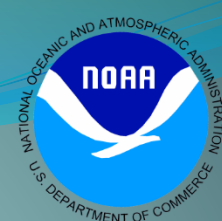
GFE – Graphical Forecast Editor

Intersite Coordination on GFE

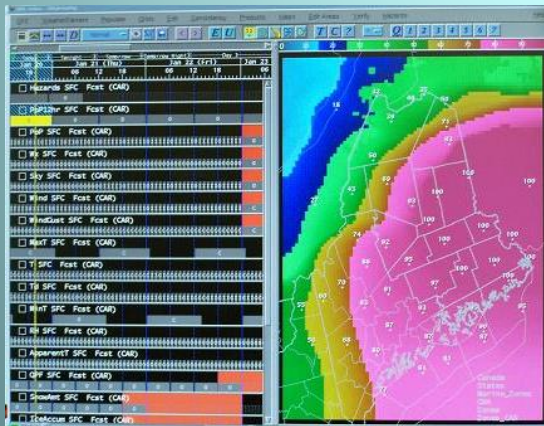
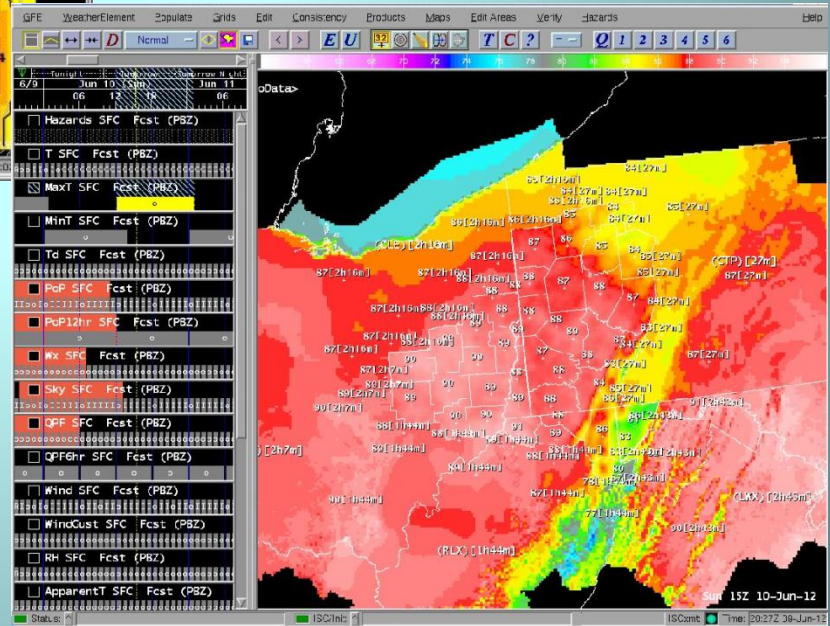
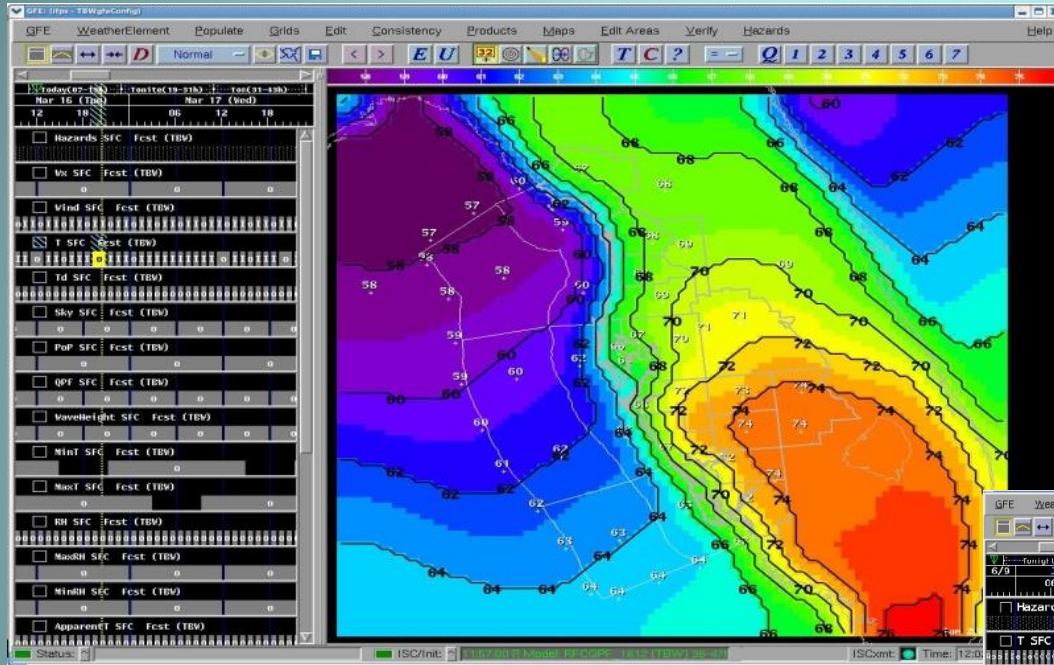




Weather GIS Applications

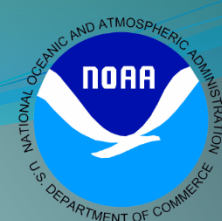


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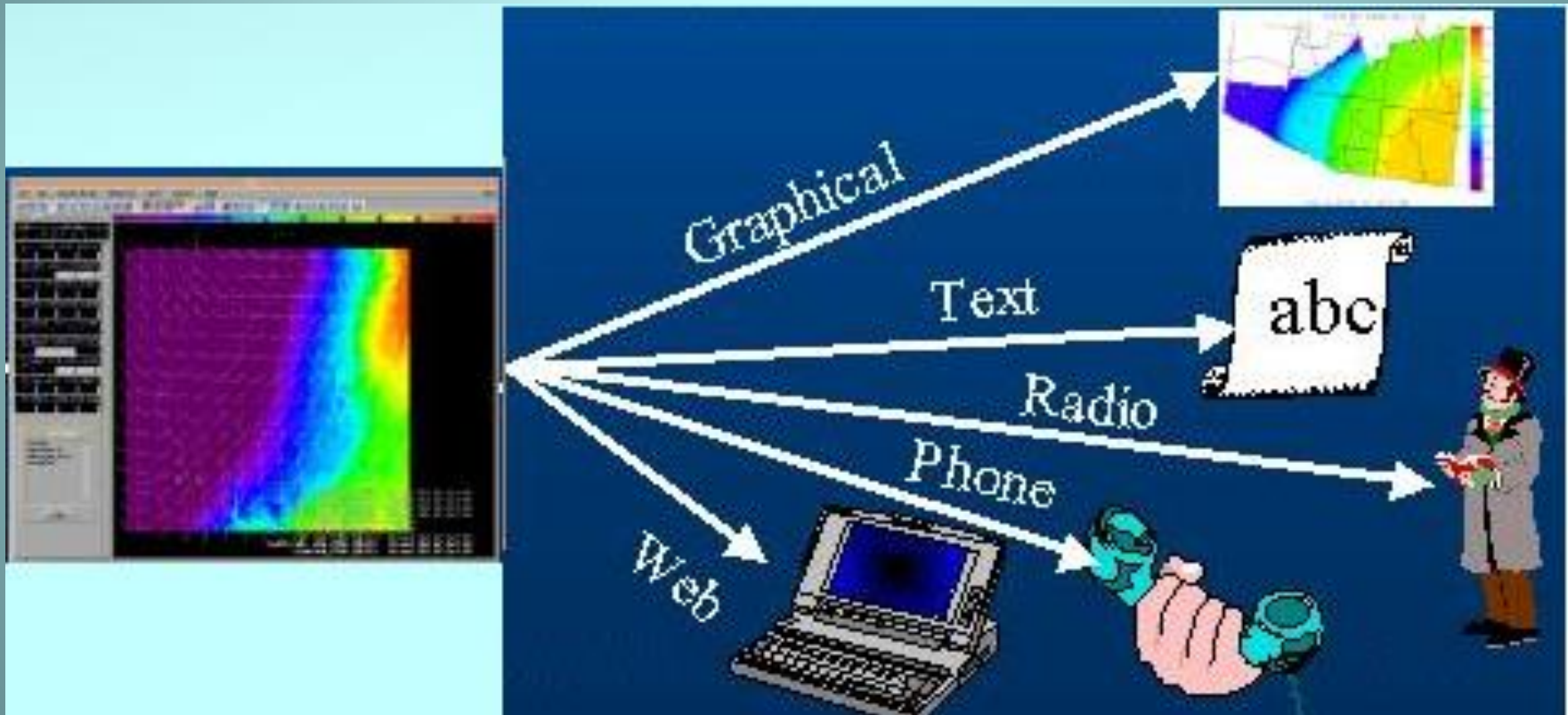




Weather GIS Applications



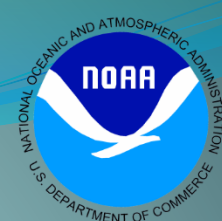
GFE – Graphical Forecast Editor





Weather GIS Applications

<http://digital.weather.gov>



NATIONAL WEATHER SERVICE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION



- HOME
- FORECAST
- PAST WEATHER
- WEATHER SAFETY
- INFORMATION CENTER
- NEWS
- SEARCH
- ABOUT

Graphical Forecasts

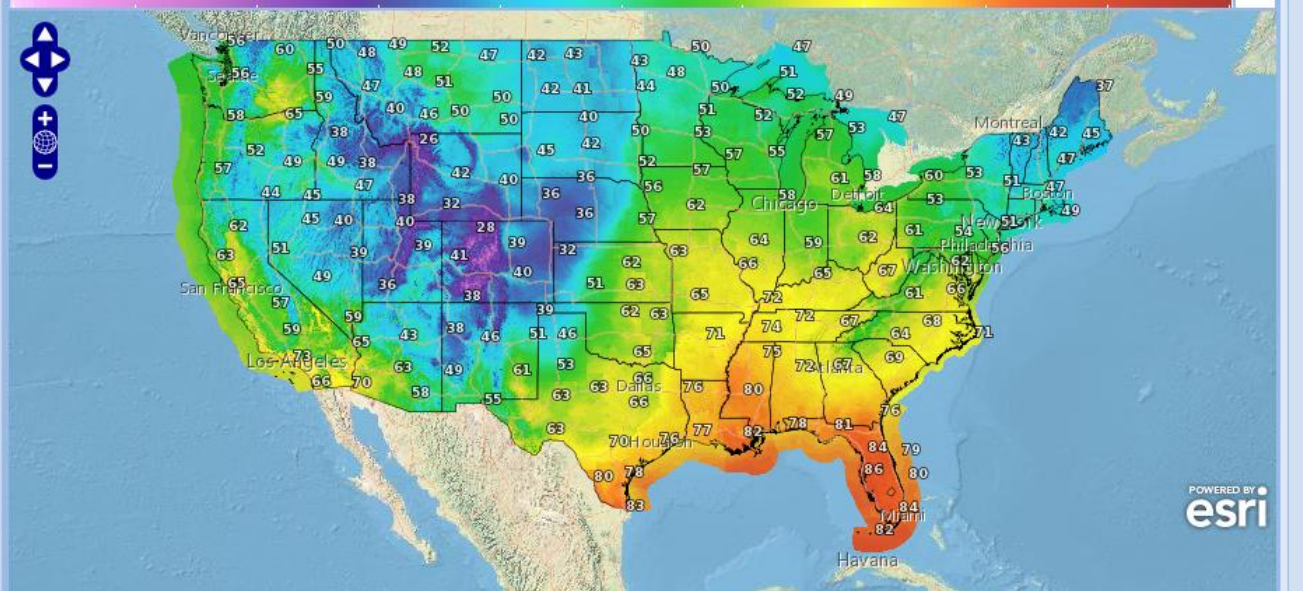
Weather.gov - National Digital Forecast Database Graphical Forecasts

National Weather Service

National Headquarters

National Digital Forecast Database Display

National (CONUS) Maximum Temperature (°F) Ending Nov 17, 6 PM CST



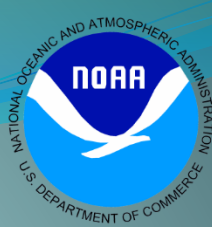
Maximum Temperature (°F)
Daytime High for: Tue, Nov 17 2015, 6 PM CST
Issued: Nov 17 at 1 PM CST

- Create a bookmarkable URL
- Definitions
- About
- FAQs
- Product Descriptions
- Survey/Comments
- NDFD Data
- Mobile Link
- Help
- Map Options
- Print Map

- National (CONUS)
- Alaska
- Hawaii
- Guam
- Puerto Rico
- Tropical Atlantic
- Tropical Pacific



Hydrology GIS Applications



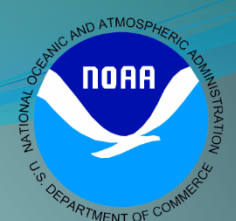
Two major GIS application packages:

CHPS – Community Hydrologic Prediction System

MPE – Multi-Sensor Precipitation Estimator



Hydrology GIS Applications



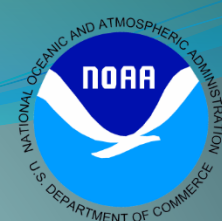
CHPS – Community Hydrologic Prediction System

What is CHPS?

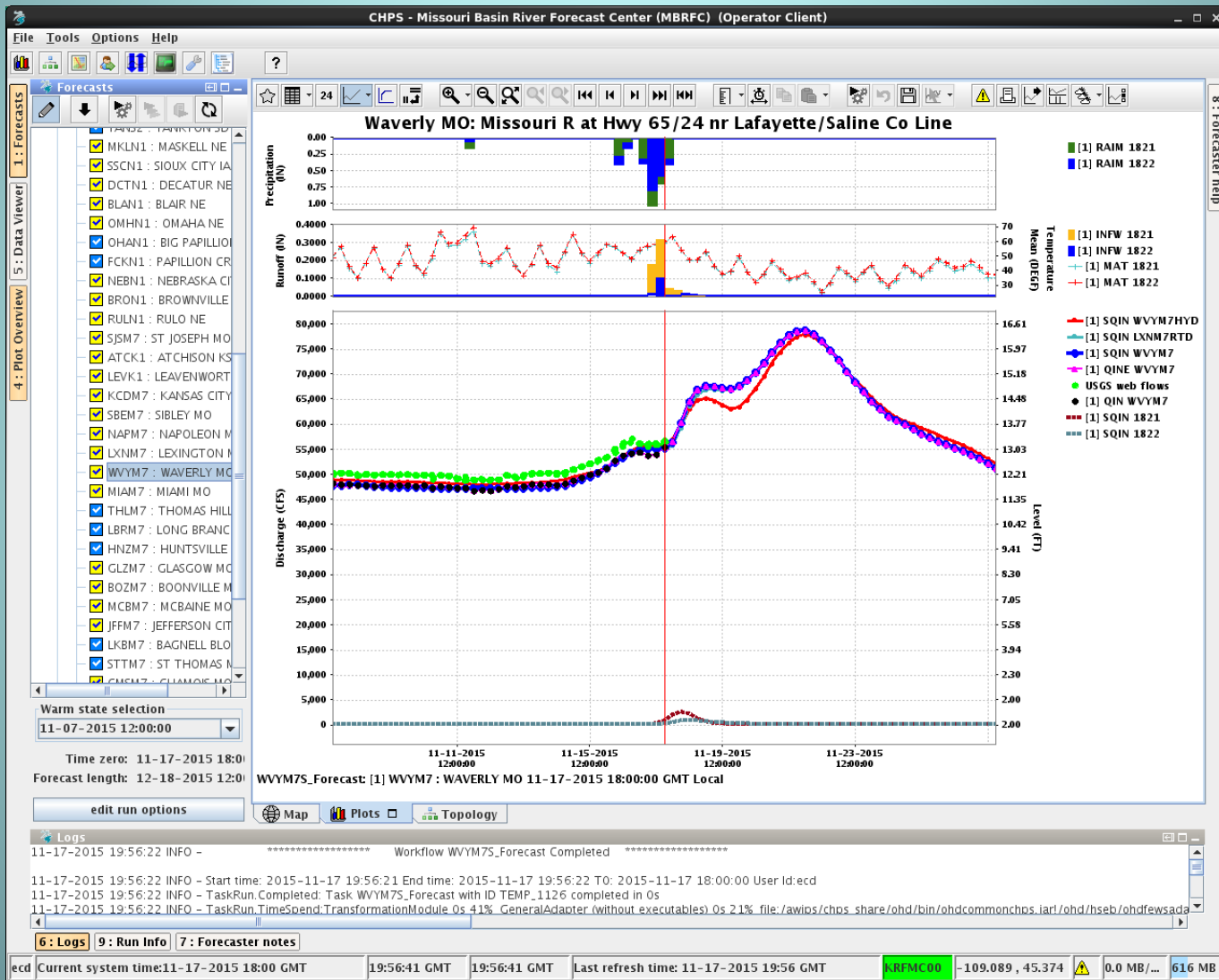
- A conglomeration of hydrologic models and data handling systems used to generate river forecasts and water resource information for the National Weather Service's 13 River Forecast Centers.



Hydrology GIS Applications

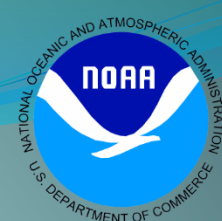


CHPS – Community Hydrologic Prediction System

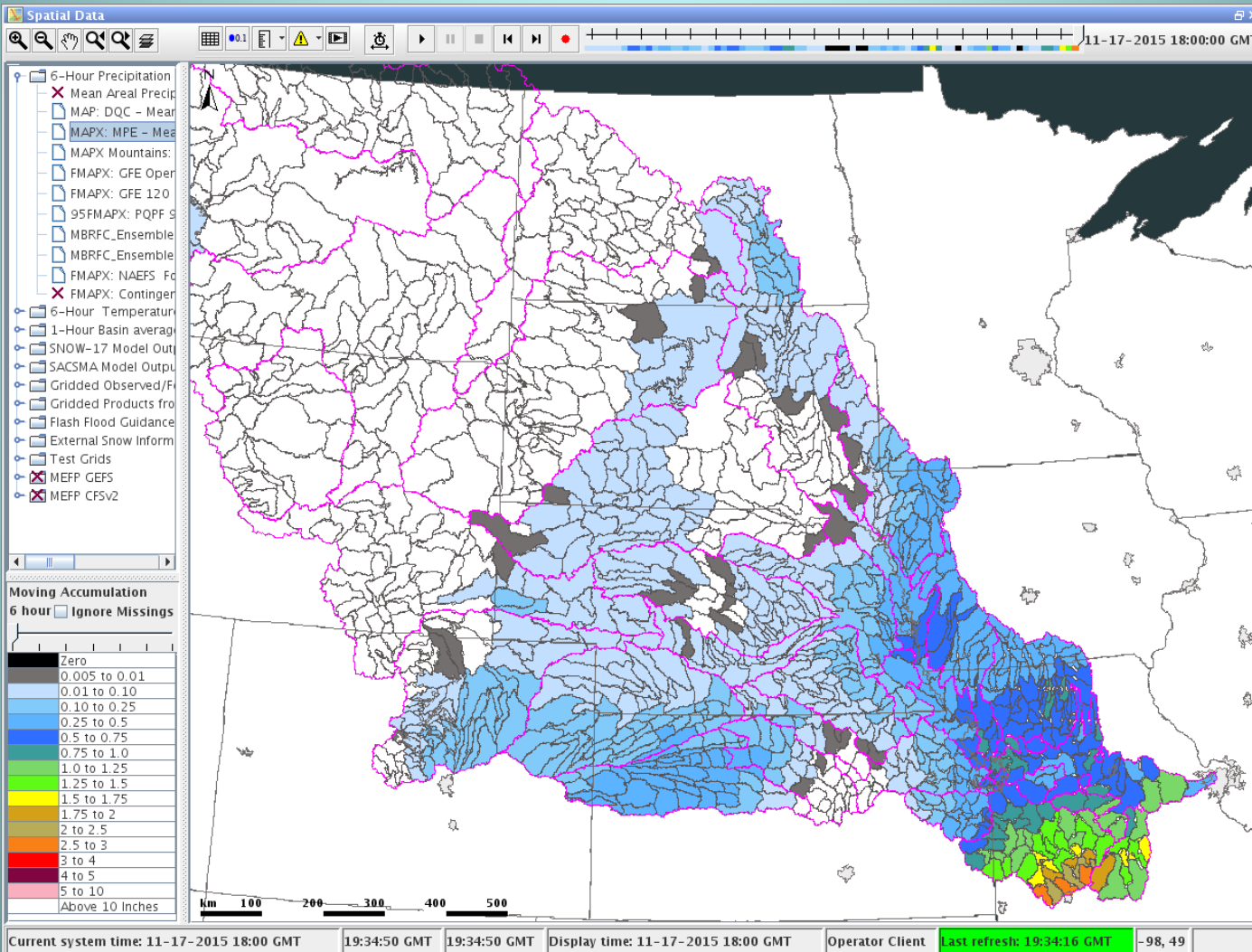




Hydrology GIS Applications

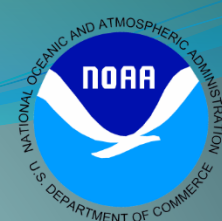


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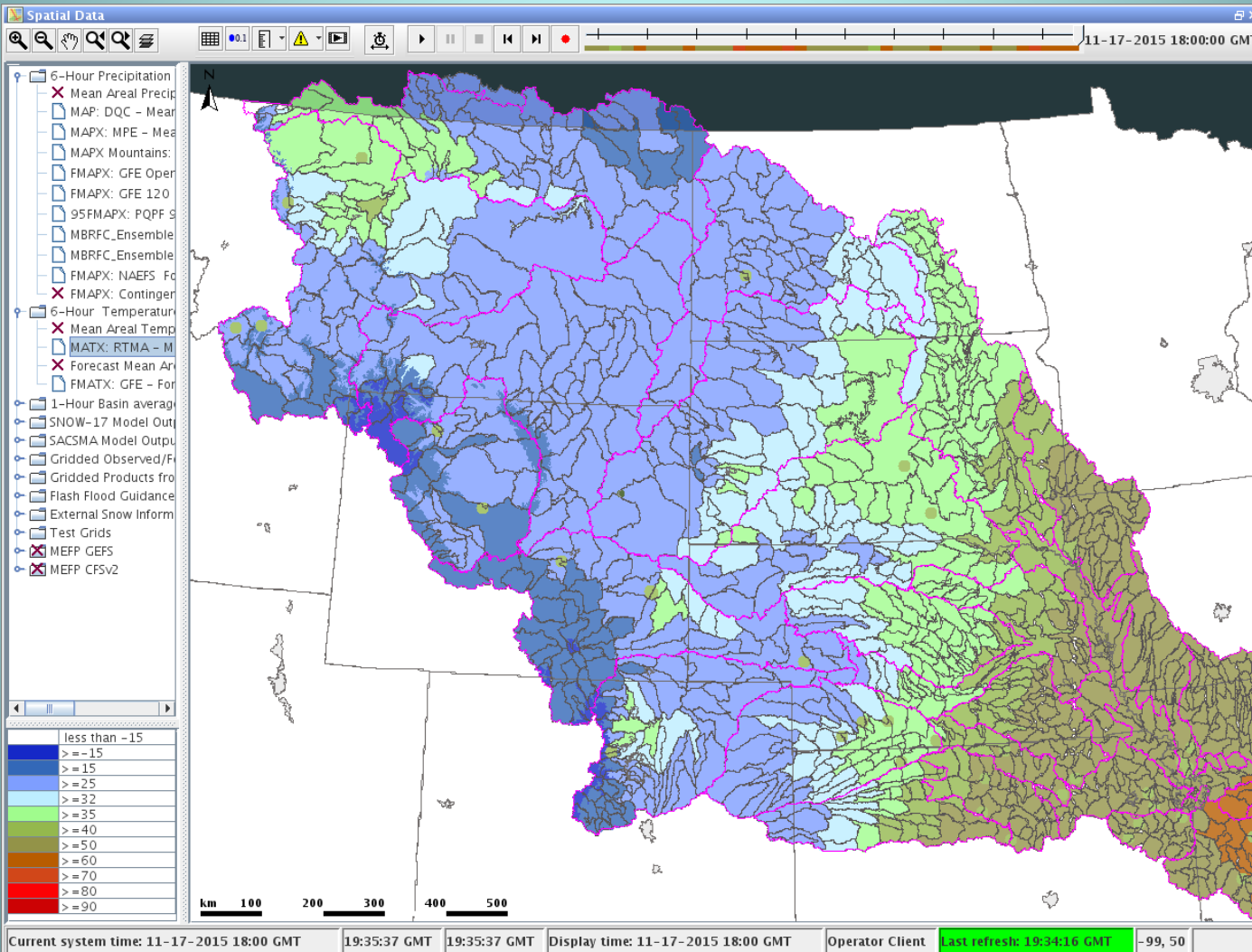




Hydrology GIS Applications

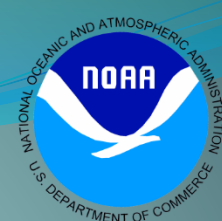


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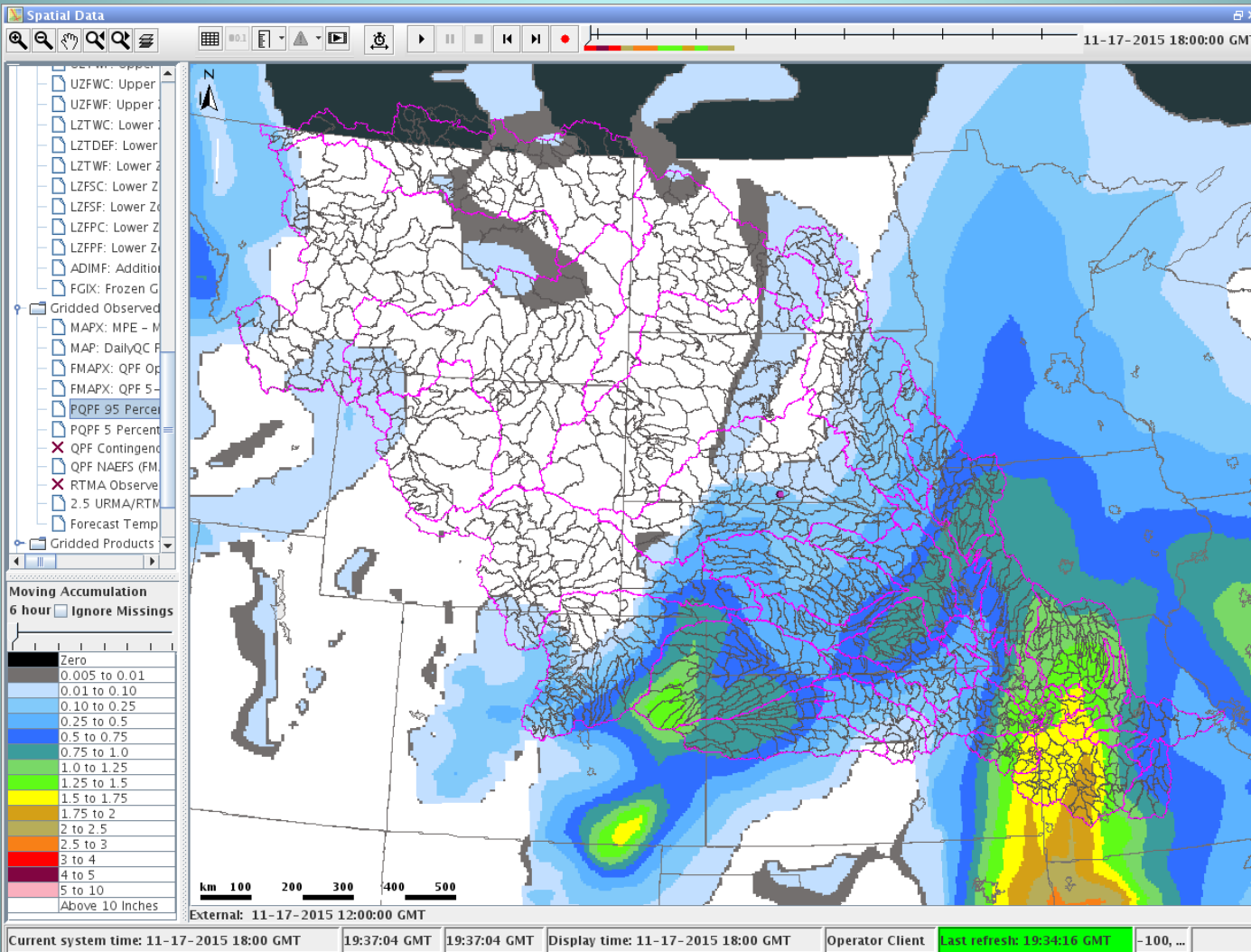




Hydrology GIS Applications

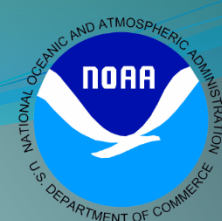


CHPS – Community Hydrologic Prediction System

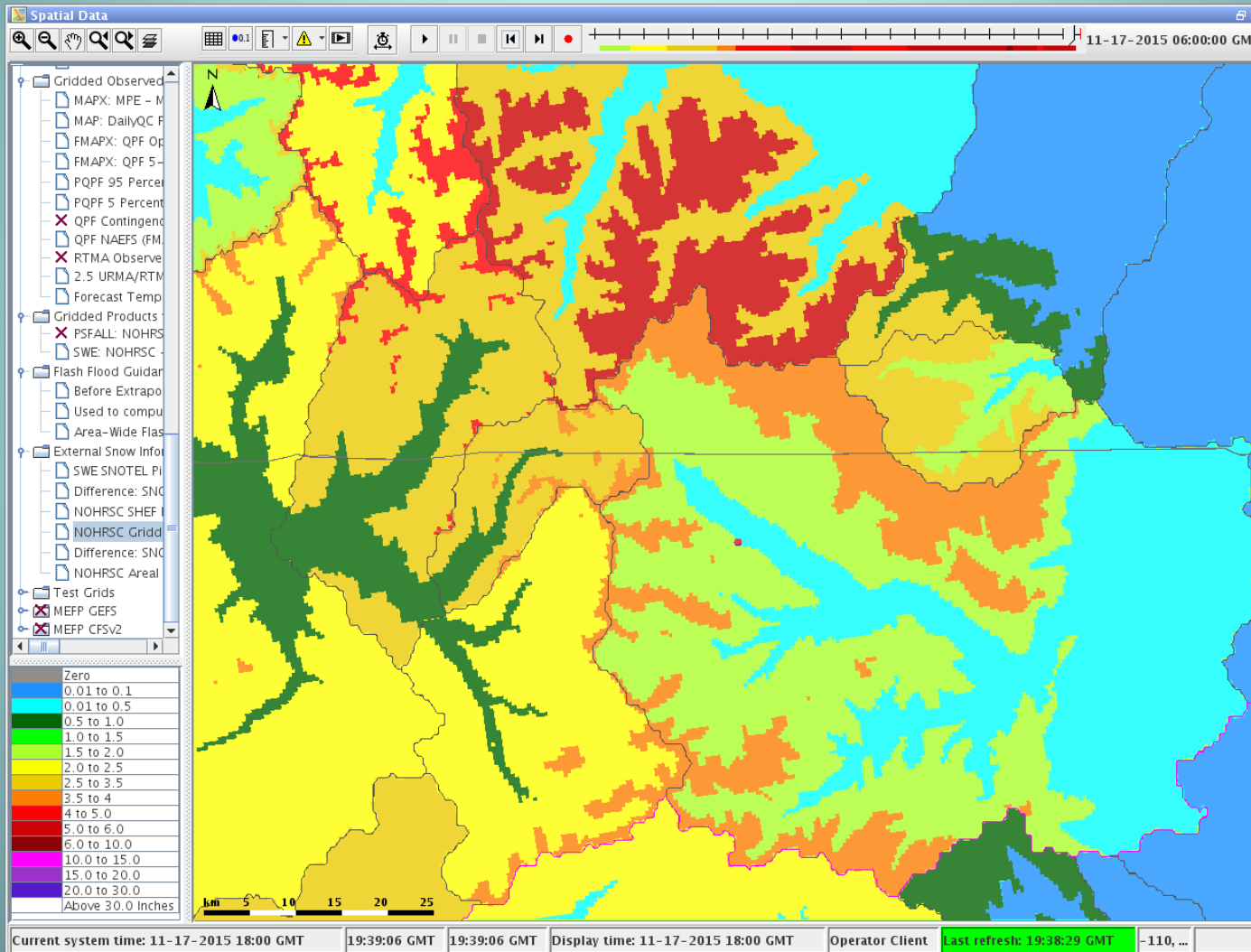




Hydrology GIS Applications



CHPS – Community Hydrologic Prediction System





Hydrology GIS Applications



MPE – Multi-Sensor Precipitation Estimator

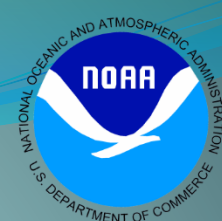
Multisensor Precipitation Estimates are a combination of radar rainfall estimates and actual precipitation gage measurements.

Forecasters enhance radar rainfall grids using ground truth point precipitation data.

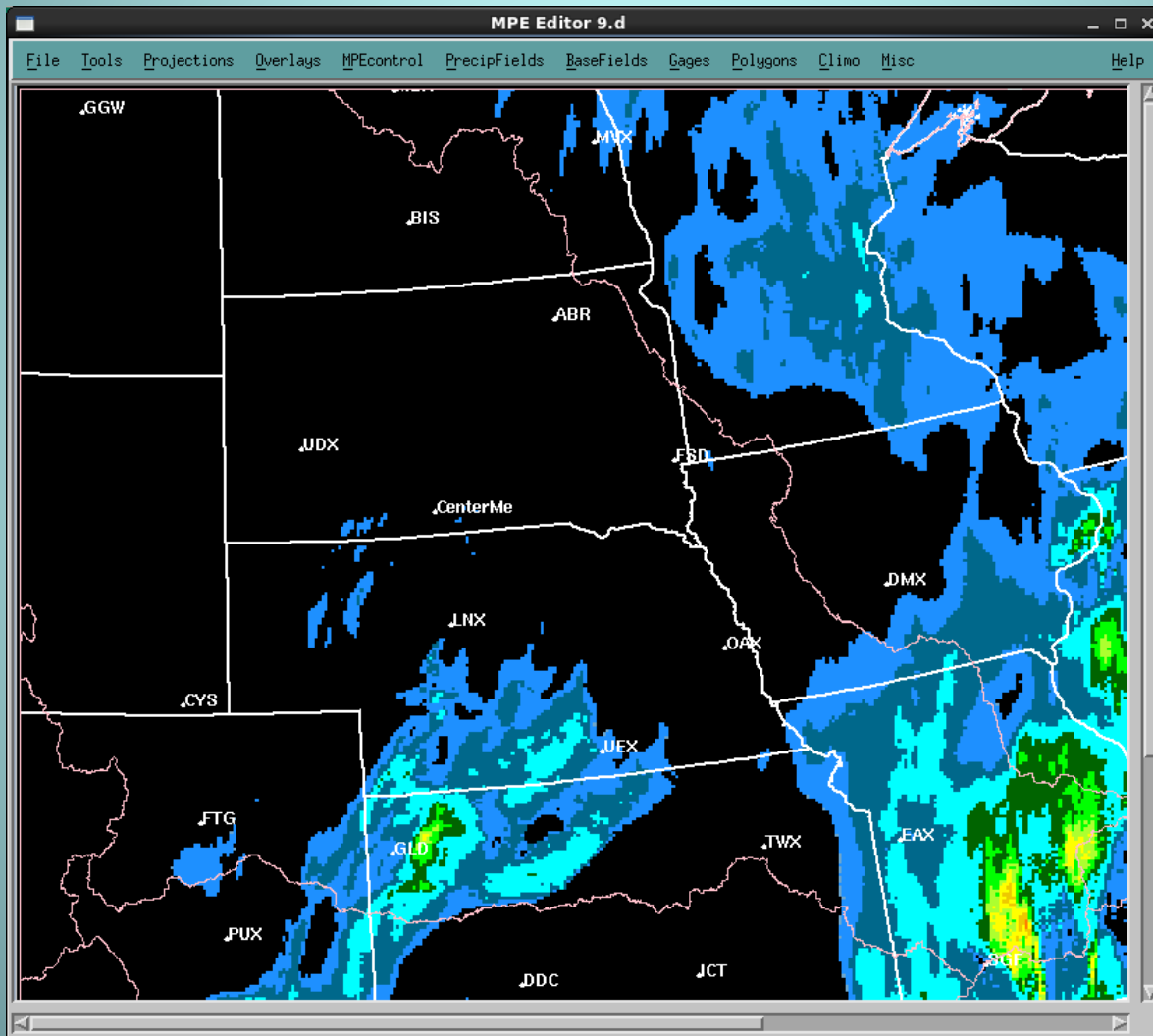
Used mainly for input to soil moisture models for river flood forecasting.



Hydrology GIS Applications

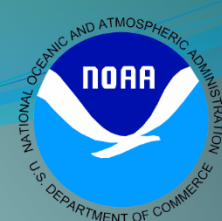


MPE – Multi-Sensor Precipitation Estimator





Hydrology GIS Applications



MPE – Multi-Sensor Precipitation Estimator

The screenshot displays the MPE Editor 9.d software interface. The main window shows a map with a precipitation estimate overlaid on a black background. The precipitation is represented by blue and white pixels, indicating different intensity levels. A white polygon outlines a specific area of interest on the map. The 'Edit Precipitation' dialog box is open on the right side of the screen. It features a 'Make Persistent' checkbox, a numerical value of 0.00, and a slider. Below these are buttons for 'Set', 'Raise', 'Lower', 'Scale', and 'Snow'. A list of precipitation estimation methods is shown, including Radar Mosaic, Average Radar Mosaic, Max Radar Mosaic, Field Bias Radar Mosaic, Local Bias Radar Mosaic, Gage Only Analysis, Multisensor Mosaic, Local Bias Multisensor Mosaic, Satellite Precip, Local Bias Satellite Precip, Satellite Radar Mosaic, Satellite Radar Gage Mosaic, Triangulated Local Bias Mosaic, Best Estimate QPE, Raw Q2 Mosaic, Local Bias Q2 Mosaic, Multisensor Q2 Mosaic, Local Field #1, Local Field #2, Local Field #3, and RFC QPE Mosaic. At the bottom of the dialog are 'Substitute' and 'Close' buttons. The bottom of the main window shows a 'Logs' panel with several entries from 11-17-2015, and a status bar with system time, GMT times, and a refresh time.

MPE Editor 9.d

File Tools Projections Overlays MPEcontrol PrecipFields BaseFields Gages Polygons Climo Misc

Edit Precipitation

Make Persistent

0.00

Set Raise Lower Scale Snow

- Radial Mosaic
- Average Radar Mosaic
- Max Radar Mosaic
- Field Bias Radar Mosaic
- Local Bias Radar Mosaic
- Gage Only Analysis
- Multisensor Mosaic
- Local Bias Multisensor Mosaic
- Satellite Precip
- Local Bias Satellite Precip
- Satellite Radar Mosaic
- Satellite Radar Gage Mosaic
- Triangulated Local Bias Mosaic
- Best Estimate QPE
- Raw Q2 Mosaic
- Local Bias Q2 Mosaic
- Multisensor Q2 Mosaic
- Local Field #1
- Local Field #2
- Local Field #3
- RFC QPE Mosaic

Substitute Close

Logs

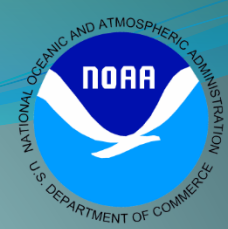
- 11-17-2015 19:22:00 INFO - Rolling barrel completed in 1.2 s
- 11-17-2015 19:21:59 INFO - Rolling barrel started
- 11-17-2015 19:21:56 INFO - Rolling barrel will be started soon
- 11-17-2015 19:12:04 INFO - Rolling barrel completed in 0.2 s
- 11-17-2015 19:12:04 INFO - Rolling barrel started

6: Logs 9: Run Info 7: Forecaster notes

ecd Current system time:11-17-2015 18:00 GMT 19:32:58 GMT 19:32:58 GMT Last refresh time: 11-17-2015 19:32 GMT KRFMC00



GIS Frameworks in the National Weather Service



Thank you for your time.

Questions?