4D Weather Visualization Workbench (WxWb)

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Weather Data Overload

National Weather Service is expecting the amount of weather data available to the forecaster to multiply exponentially in the next 3-5 years.

There are several efforts in the community to come to a 4-D weather data standard: NextGen, IC-DoD

At this time, few Commercial-Off-The-Shelf (COTS) tools are currently available to handle the processing, fusion and interpretation of this data.

**PROBLEM:** More data than ever but few tools available to handle it.
4D Weather Cube

This cube will exist on multiple servers and will be distributed through a service oriented architecture (SOA) system.

A Single-Authoritative Source (SAS) of weather observations will be determined for every period which will be used by the FAA for planning flight routes.
Visualization Requirements

There exists a need for a timely and scalable web-based weather analysis and visualization capability.

Allow the operational end user to discover, access, correlate and visualize multiple sensors and relevant data needed to support tactical and strategic operations.
Feed 1: Airborne/satellite imagery

Feed 2: Real time weather data

Feed 3: Forecasted weather model

User requests data via visualization tool

Weather Data Cube

Selectable Persistence/ Surveillance

3D/Elevation Visualization: cloud and UAV elevation, sun angle, etc. tied into real-time weather and forecast weather model

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Weather Workbench (WxWb) will allow the end user full access to weather data such as forecasts and historical meteorological databases available on the internet.

It employs several modalities of data connectivity, like:

> Embedded Google Earth™/Google Maps™ display,
> Web map service (WMS) for importing geo-referenced maps, and
> Custom designed URL queries to stream forecast weather data (Grib, netCDF) from a NOAA web database.

Simple, easy-to-use display interface using ENVI’s full suite of image processing and analysis tools.
Embedded Google Earth™ and Google Map™ displays. Access to most Google services (pan, zoom, rotate)

Quick search tool (button Find) to “fly” to a specific city or airport.
Forecast weather data can be pulled from a local file repository, or downloaded from a NOAA website via FTP (click "Import New Files").

Once weather file(s) have been imported, select Scenario to choose type of weather scenario to analyze.
Scenario: Severe Weather Analysis

- Downloaded Weather File(s)
- 2D Image Slices Thru Weather Cube
- 3D IsoSurface Rendering
- Traditional Meteorology Charts
- Wind Speed Vectors
- Line Contour Overlays
Severe Weather Analysis: 3D IsoSurfaces

3D isosurfaces display data of a constant value across all altitude levels (relative humidity displayed in blue).

Ability to zoom and rotate to “fly through” weather cube.

Selected weather data is co-registered over regional map or hi-res MSI imagery.
Severe Weather Analysis: 2D Slices

Create 2D image slices through variety of weather cubes

Use sliders to filter image slices via viewing angles and/or data ranges
Severe Weather Analysis: Traditional Maps

Precipitation

Relative Humidity

Lifted Index

Wind Magnitudes
Severe Weather Analysis: Animation
Scenario: Aviation Route Planning

Select Departure and Destination Airports from list

Route is plotted with active “nodes” to click, which will display time series of meteorological data at selected location (meteogram).
WxWB: Future Work

JPIP enable to bring in large imagery

Integrate with other Service Oriented Architectures (SOA)

Provided extensibility layer and API

Extend WMS and WCS service to other weather-related sites to fuse real-time data (i.e. radar, satellite images) with forecast models.

Improved Graphical Display Features:

> Improve visualization of airplane “fly-through” of storm cells (i.e. cockpit view)
> Add Mensuration and Annotation Tools
> Export Display Products/Scriptable Display workflows
Thank You!

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