

NextGen Network Enabled Weather (NNEW)

Friends/Partners in Aviation Weather
NBAA Convention - Orlando

NNEW FY08 Demonstration

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Federal Aviation
Administration



Overview

- Program Overview: NNEW
- Wx Specific Standards
- NNEW Weather Data
- Data Access
- Backup Slides
 - Detailed Descriptions of Weather Data Available



Program Description

NNEW

Establish a network-enabled, virtual 4-Dimensional Weather Data Cube, which draws information from multi-agency sources, into a consolidated data cube for aviation users.

- Key Themes:

- An integrated and nationally consistent, common weather picture for observation, analysis, and forecast data available to all users
- “Network Enabled”: Available, secured, real-time, useful information
- “Virtual”: Repository with no single physical database or computer
- Conceptually unified source distributed among multiple physical locations and suppliers
- Purpose: Provide a source of weather information for operational decision making processes

Wx Specific Services

- NNEW has been working with Open Geospatial Consortium (OGC) standards and with DoD's JMBL
- NNEW has participated in OGC working groups to extend standards to meet our needs
- OGC Standards involved are:
 - Web Coverage Services (WCS); principally for gridded data
 - Web Features Services (WFS); principally for non-gridded data



NNEW Weather Data

- Capabilities are being developed over a multi-year period with IT demonstrations conducted yearly.
 - The capabilities developed during the Federal fiscal year 2008 (FY08) were demonstrated in September 2008
- The following standards were successfully incorporated during the demonstration:
 - OGC Web Coverage Service 1.0/1.1
 - OGC Web Feature Service 1.1
 - OGC Catalogue Service for Web
 - NetCDF 3 & 4 file format using the Climate and Forecast Convention
 - ebXML/ebRIM
- Data are currently available at three locations:
 - National Center for Atmospheric Research / Research Applications Laboratory (NCAR/RAL)
 - National Oceanic & Atmospheric Administration / Global Systems Division (NOAA/GSD)
 - Massachusetts Institute of Technology / Lincoln Laboratory (MIT/LL)

NNEW Weather Data

- The following products are currently publicly available as OGC WCS 1.0/1.1 services:
 - GTG2 Turbulence (NCAR/RAL)
 - CIP Icing Probability and Severity (NCAR/RAL)
 - RUC Temperature (NCAR/RAL)
 - RUC Winds (NCAR/RAL)
 - RUC Relative Humidity (NCAR/RAL)
 - RSAS Surface Temperature (NOAA/GSD)
 - RSAS Surface Dewpoint (NOAA/GSD)
 - RSAS Surface Winds (NOAA/GSD)
 - CIWS Vertically Integrated Liquid Water (MIT/LL)
 - CIWS Echo Tops (MIT/LL)

NNEW Weather Data

- The following products are currently publicly available as OGC WFS 1.1 services:
 - METARs (NCAR/RAL & NOAA/GSD)
 - PIREPs (NCAR/RAL & NOAA/GSD)
 - TAFs (NCAR/RAL)
 - AIRMETs (NCAR/RAL)
 - SIGMETs (NCAR/RAL)

Data Access

- **NNEW Data Access Information**

- Available at WIKI website

- <https://wiki.ucar.edu/display/NNEWD/NNEW+Phase+2+Access+Information>

- **The website includes information all of the datasets**

- Each of the datasets and their service endpoints have associated metadata in the registry/repository

- The NNEW repository implements the coming ebXML 4.0 specification.
- Location: <http://ngenww2.wx.ll.mit.edu/omar-server-4.1/query>

- More detailed information included on website such as:

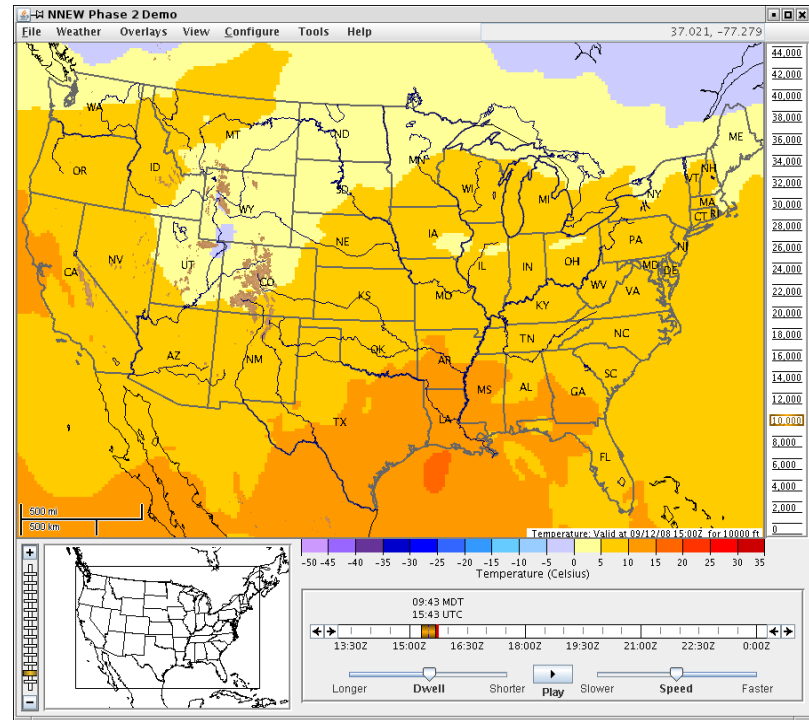
- WCS Datasets: Feature type id, WFS Access type, WFS URL
- WFS Datasets: Coverage id(s), Range (field) id, WCS Access type, Returned, Data Format, WCS URL
- And more...

NEW Weather Data

- **Visualization of the data is also available in an NEW Java Application**

- Data Included in the NEW Phase II Java Application:

- AIR/SIGMETs
- TAFs
- Current Icing Potential
- Current Icing Severity
- DOD Model Air Temperature
- Echo Tops
- GOES Satellite Imagery
- Lightning
- METARs
- PIREPs
- Radar Base Reflectivity
- Radar Composite Reflectivity
- Rapid-Refresh Model Data
- RUC Model Data
- Surface Air Temperature
- Surface Dewpoint Temperature
- Surface Wind
- Turbulence
- Vertically Integrated Liquid



<http://weather.aero/nnew/phase2/>

Backup Slides



Data Access Website

NNEW Phase 2 Access Information

Added by [Aaron Braeckel](#), last edited by [Aaron Braeckel](#) on Sep 25, 2008 ([view change](#))

NNEW Phase 2 work included a number of datasets from the three NNEW labs: MIT Lincoln Labs, NCAR, and NOAA GSD. This includes convection forecasts, turbulence forecasts, radar, satellite, many of the standard WMO products such as METARs and TAFs, and more. Each of these datasets and their service endpoints have associated metadata in the registry/repository.

Registry/repository

The NNEW Phase 2 repository contains metadata about the datasets available through Phase 2 services and information on the service endpoints themselves, including WSDL files for SOAP endpoints. Additionally, ontological mappings between the NetCDF CF convention and JMML parameter names as well as the ontological data types associated with each dataset are provided. The registry/repository also includes several taxonomies, one of which is the dataset associations for different types of Single Authoritative Source.

The NNEW repository implements the coming EbXML 4.0 specification.

Location: <http://ngennw2.wx.ll.mit.edu/omar-server-4.1/query>

OGC Web Feature Service Datasets

The WFS datasets are available in GML format. However, a data model has not yet been chosen and these products are not consistent in units or conventions. NNEW Phase 3 will include a data model (such as WXCIM or CSML) and more in-depth unit and schema associations. The following products are available from an OGC Web Feature Service:

Data set	Host	Feature type id	WFS Access type	WFS URL
METARs	NCAR	metarsSpatial	KVP, XML POST	http://weather.aero/geoserver/wfs
PIREPs	NCAR	pirepsSpatial	KVP, XML POST	http://weather.aero/geoserver/wfs
TAFs	NCAR	tafsSpatial	KVP, XML POST	http://weather.aero/geoserver/wfs
AIR/SIGMETs	NCAR	airSigmetsSpatial	KVP, XML POST	http://weather.aero/geoserver/wfs
METARs	NOAA	metar	KVP, XML POST	http://nextgen.fsl.noaa.gov/geoserver/wfs
PIREPs	NOAA	pirep	KVP, XML POST	http://nextgen.fsl.noaa.gov/geoserver/wfs

NOTE: MIT LL provided lightning data during Phase 2, but the raw data is not available for public access for contractual reasons.

OGC Web Coverage Service Datasets

The following products are available from an OGC Web Coverage Service in this phase:

Data set	Host	Coverage id(s)	Range (field) id	WCS Access type	Returned Data Format	WCS URL
RUC Temperature (20km)	NCAR	um.fdc.ncar.ucar.edu:Dataset:RUC20_Air_Temperature	TMP	WCS 1.1 - SOAP	NetCDF 4 (CF convention)	http://weather.aero/wcs2/soap

Screen Shot of Data Access Website

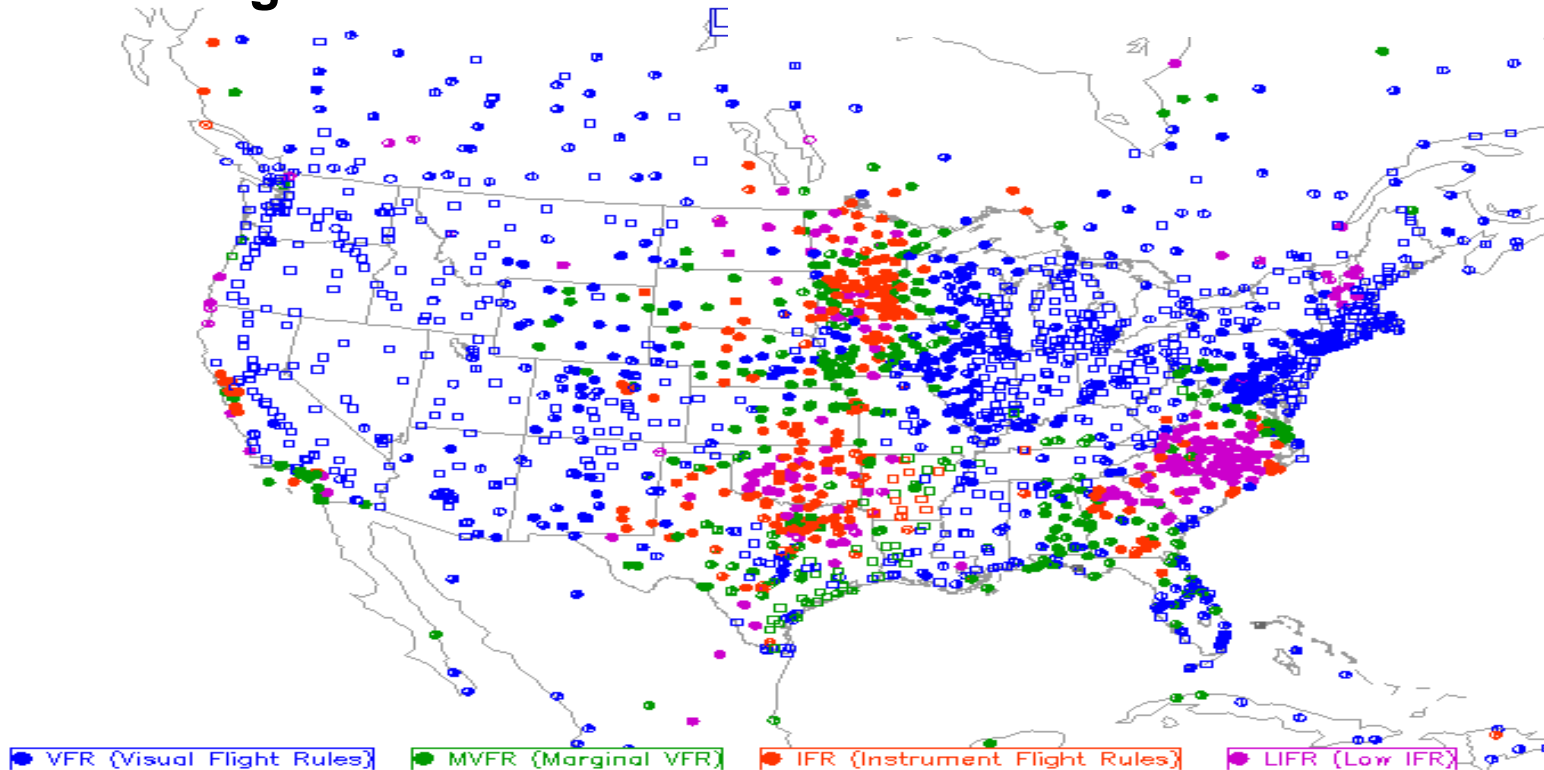


Weather Observations

- Aviation Routine Weather Report (METAR)
 - **Definition**
 - Predominantly used by pilots in fulfillment of a part of a pre-flight weather briefing, and by meteorologists, who use aggregated METAR information to assist in weather forecasting.
 - **Description of Data**
 - Text/Point data
 - Updated Hourly
 - **Domain**
 - North America
 - **Sample**
 - KDCA 111252Z 07005KT 10SM BKN050 OVC080 22/14 A3034
RMK AO2 SLP272 BINOVC T02170144

Weather Observations

- Aviation Routine Weather Report (METAR)
 - Coverage



Weather Observations

- Pilot Reports (PIREPs)
 - **Definition**
 - A report of in-flight weather by an aircraft pilot or crew member. A complete report includes the following information in this order: location and/or extent of reported weather phenomena; time of observation; description of phenomena; altitude of phenomena; type of aircraft (only with reports of turbulence or icing).
 - **Description of Data**
 - Text/Point data
 - Updated Hourly
 - **Domain**
 - Continental United States (CONUS)
 - **Sample**
 - T47 UA /OV SPS130010 /TM 1249 /FL240 /TP PC12 /SK OVC-TOP230/ SKC /TA M19 /WV 20311KT /TB OCNL LGT CHOP

Weather Analysis

- CIWS – Corridor Integrate Weather System
 - **Definition**
 - VIL – Vertically Integrated Liquid – A measure of precipitation intensity. VIL can be thought of as an amount of liquid (water) observed in a vertical column extending from ground level to the upper extent of radar coverage.
 - Echo Tops - Provides a measure of storm height, as observed by radar systems. Echo Tops are expressed in units of height above a reference altitude, typically kilofeet above Mean Sea Level.
 - **Description of Data**
 - 2-D & 3-D Grid
 - **Domain**
 - Continental United States (CONUS)

Weather Advisories

- AIRMET & SIGMET

- **Definition**

- **AIRMET** - A weather advisory issued by a meteorological watch office for aircraft that is potentially hazardous to low-level aircraft /aircraft with limited capability.
 - **SIGMET** - A weather advisory that contains meteorological information concerning the safety of all aircraft.

- **Description of Data**

- Area

- **Sample**

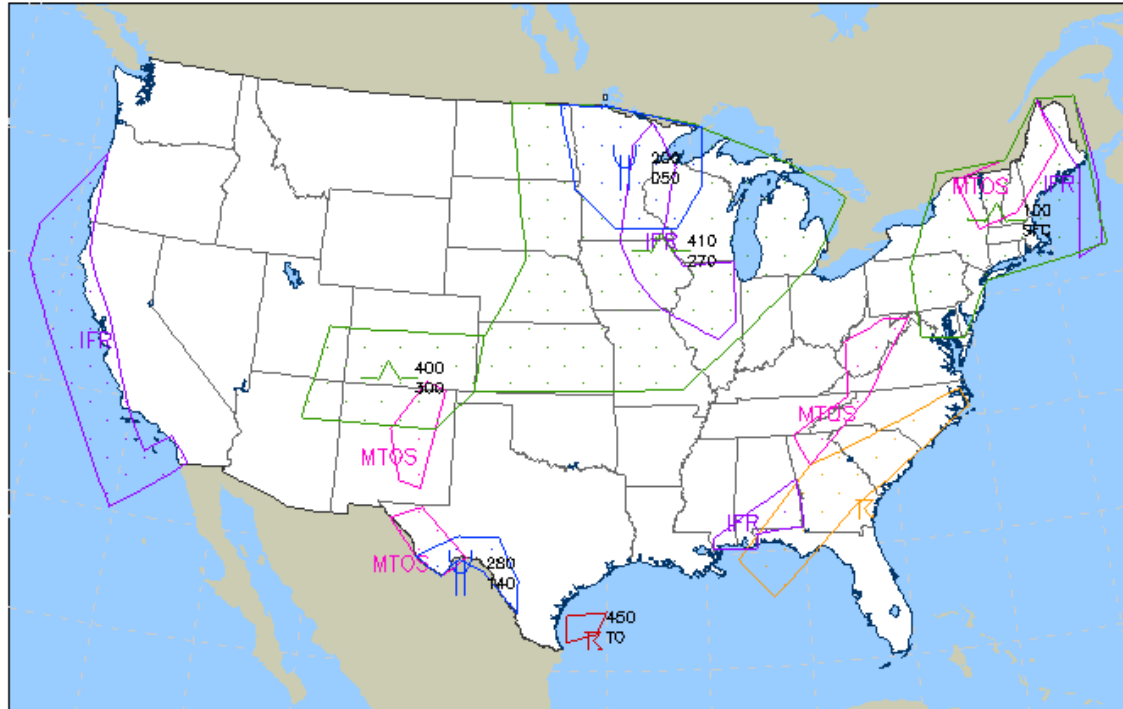
- KDCA 111252Z 07005KT 10SM BKN050 OVC080 22/14 A3034
RMK AO2 SLP272 BINOVC T02170144

Weather Advisories

All active AIRMETs and SIGMETs

chart created at 1655 UTC Mon 15 Sep 2008

AIRMETs valid until 2100z/15th, SIGMETs expire at or before 1855z/15th




Turbulence
AIRMET


Icing
AIRMET


IFR
Instrument
Flight Rules
AIRMET


MTOS
Mountain
Obscuration
AIRMET


Convective
Outlook


Convective
SIGMET

Weather Forecasts & Analysis

- TAFs (Terminal Area Forecast)
 - **Definition**
 - A format for reporting weather forecast information, particularly as it relates to aviation. Generally a TAF is a 9- or 12-hour forecast, though some TAFs can cover an 18- or 24-hour period.
 - **Description of Data**
 - Text/Point data
 - Updated every 6 hours (typically)
 - **Domain**
 - North America
 - **Sample**
 - KIAD 151400Z 151412 30015G24KT P6SM FEW040 SCT070
 - FM2200 33007KT P6SM SCT250
 - FM0400 VRB03KT P6SM SCT080 BKN250

Weather Forecasts & Analysis

- RUC – Rapid Update Cycle

- **Definition**

- The RUC is a NOAA/ NCEP operational weather prediction system comprised primarily of a numerical forecast model and an analysis/assimilation system to initialize that model. It was developed to serve users needing frequently updated short-range weather forecasts, including those in the US aviation community and US severe weather forecasting community.

- **Description of Data**

- Gridded (GRIB1)
- Updated Hourly
- Temperature, Wind Speed/Direction, and Relative Humidity

- **Domain**

- North America

Weather Forecasts & Analysis

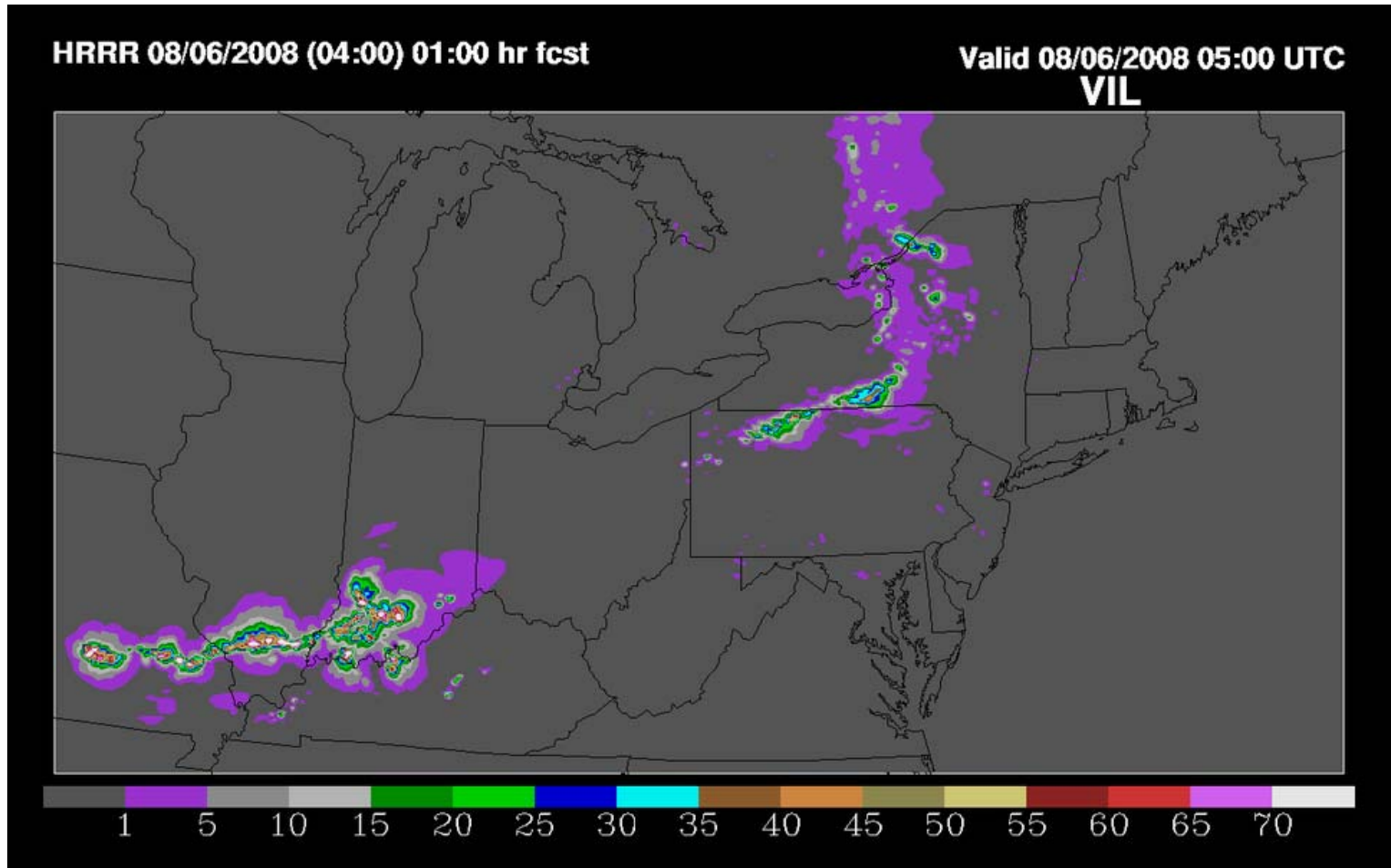
- RUC-RTMA – Real Time Mesoscale Analysis
 - **Definition**
 - The RTMA is a “quick look” analysis designed to meet the immediate need of those requiring a real time gridded analysis. Surface data that provides a 5-km gridded estimate of current surface and near-surface conditions
 - **Description of Data**
 - Gridded (GRIB1)
 - Updated Hourly
 - Produces analyses of 2 m temperature, 2m dew-point and 10 m wind
 - **Domain**
 - CONUS

Weather Forecasts & Analysis

- RUC-HRRR – High Resolution Rapid Refresh
 - **Definition**
 - The HRRR is a 3-km resolution, hourly updated, cloud-resolving atmospheric model, initialized by DFI-fields from the 13km radar-enhanced RUC run at NOAA/ESRL/GSD
 - **Description of Data**
 - Gridded Binary Data (GRIB1)
 - Updated Hourly
 - **Domain**
 - Northeast Corridor domain from Missouri-Minnesota on the western boundary to the Atlantic Ocean on the east boundary.

Weather Forecasts & Analysis

- RUC-HRRR



Weather Forecasts & Analysis

- GTG – Graphic Turbulence Guidance
 - **Definition**
 - An automatically-generated turbulence product that predicts the location and intensity of turbulence.
 - **Description of Data**
 - 3-D Grid
 - Updated Hourly
 - **Domain**
 - CONUS

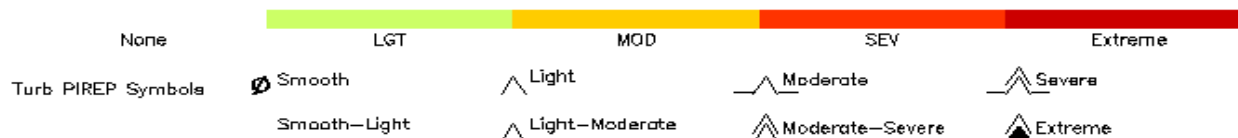
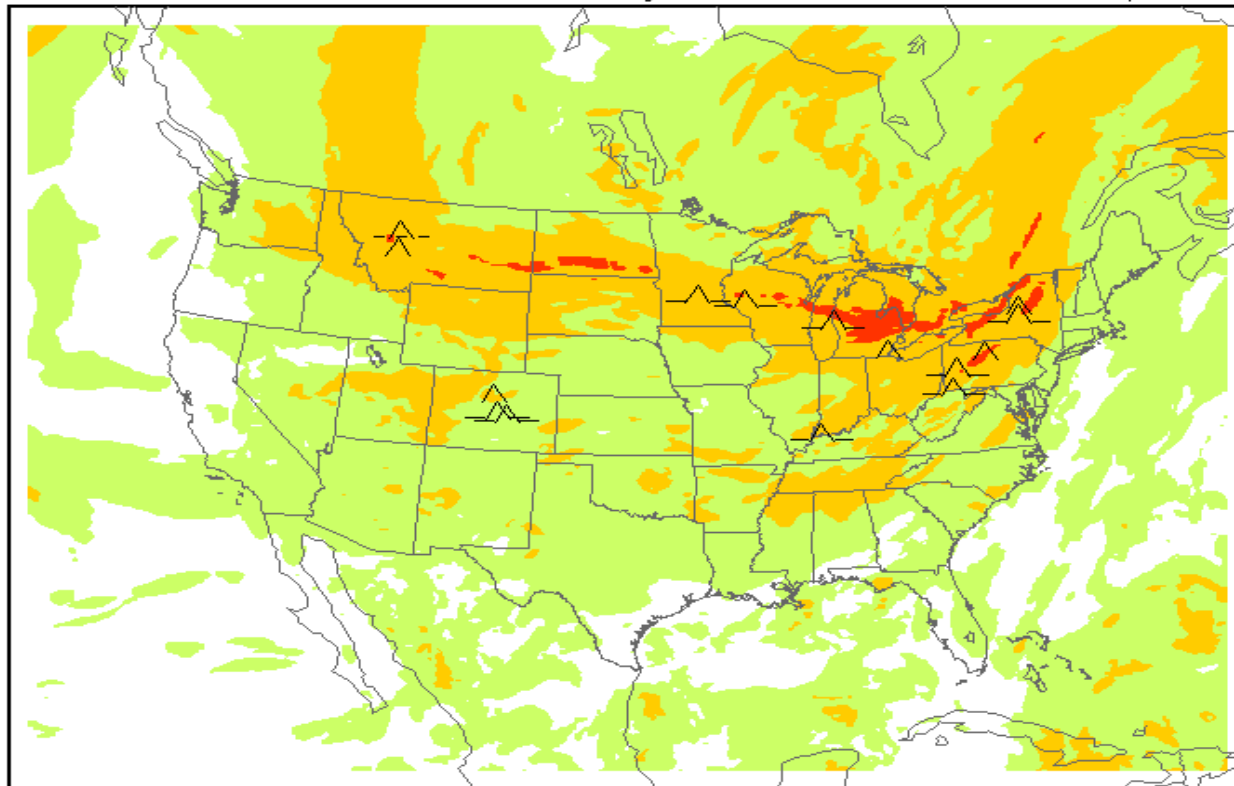
Weather Forecasts & Analysis

The GTG is an automatically-generated turbulence forecast product that supplements AIRMETs and SIGMETs by identifying areas of turbulence. The GTG is not a substitute for turbulence information contained in AIRMETs and SIGMETs. It is authorized for operational use by meteorologists and dispatchers.

- GTG

Maximum turbulence potential (FL200-FL450)

Analysis valid 2000 UTC Sun 07 Sep 2008



Probabilistic Forecasts

- NCWD/NCWF
 - **Definition**
 - The NCWF system produces 30-, 60-, 90- and 120-minute probabilistic forecasts are every 5 minutes. The frequent update cycle is used to reflect the rapidly changing nature of thunderstorms which evolve over very short time scales (order 30 min).
 - **Description of Data**
 - Point or Grid
 - **Domain**
 - CONUS

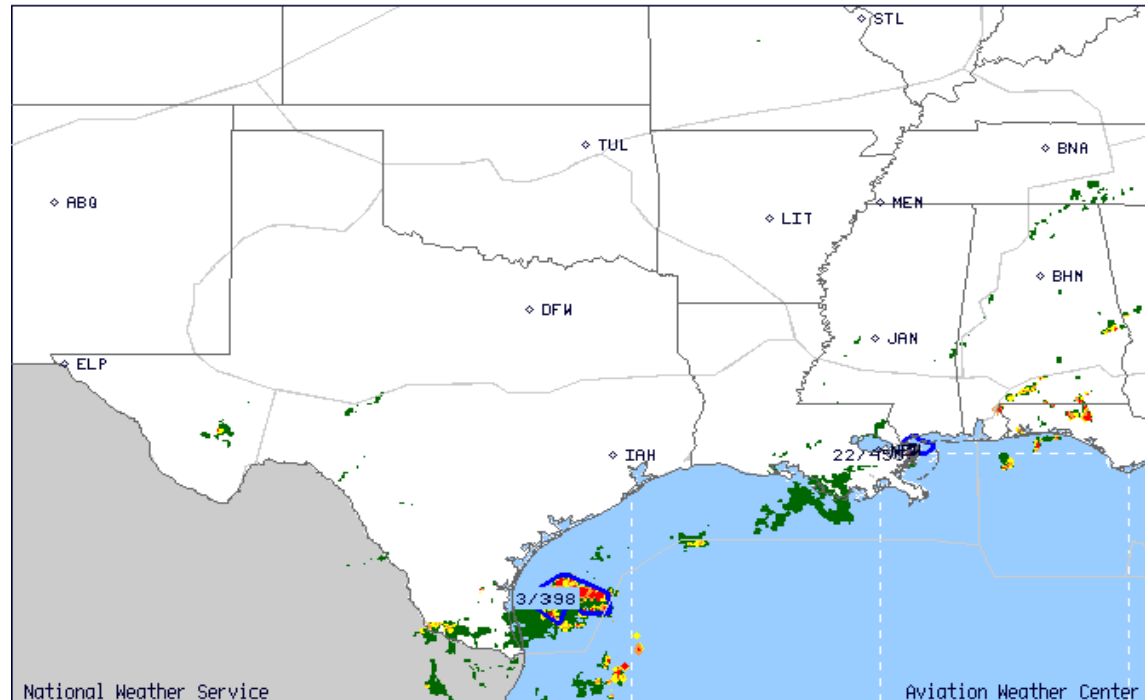
Probabilistic Forecasts

- NCWD/NCWF

National Convective Weather Forecast Product (NCWF)

[FYI/Help](#)

Data Time: Sep 15, 2008 17:15 GMT National Convective Weather Forecast Valid Time: Sep 15, 2008 18:15 GMT



The NCWF is an automatically generated depiction of: (1) current convection and (2) extrapolated significant current convection. It is a supplement to, but does NOT substitute for, the report and forecast information contained in Convective SIGMETs.

play stop |< < > >| Image: 024/024

forward reverse

Detection Forecast Performance

2 hours [24 images] 24 hours [1 image per hour]

6	Red
5	Orange
4	Yellow
3	Light Green
2	Green
1	Dark Green

Probabilistic Forecasts

- CIP – Current Icing Product
 - **Definition**
 - Provides current information via icing severity graphics and icing probability graphics.
 - Severity is also included and is a supplementary weather product (for increased situational awareness) that provides a graphical view of the current icing environment. CIP products are not forecasts, but presentations of current conditions at the time of the analysis
 - **Description of Data**
 - NetCDF 4 (CF convention)
 - **Domain**
 - CONUS

Weather Data Compilation

- MADIS - Meteorological Assimilation Data Ingest System

- **Definition**

- Originally from the National Oceanic and Atmospheric Administration's (NOAA) Earth System Research Laboratory (ESRL) Global Systems Division (GSD)
- (MADIS) is dedicated toward making value-added data available for the purpose of improving weather forecasting, by providing support for data assimilation, numerical weather prediction, and other hydrometeorological applications

- **Description of Data**

- Text, Point, and Gridded data
- Originally NetCDF

- **Domain**

- Global, observations with the highest spatial and temporal density exist in North America