

MetFetch: Automated Meteorological Data Retrieval for Fast-Running Emergency Response Codes

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Jeremy Rishel (PNNL)

Fred Rutz (PNNL)

George Athey (Athey Consulting)

Van Ramsdell (Ramsdell Environmental Consulting, LLC)



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Problem Statement

- ▶ Obtaining meteorological observations and forecasts for fast-running emergency response codes can be challenging; potential issues include:
 - Accident location may be “Anywhere USA”
 - Lack of site familiarity and station availability
 - Untimely data
 - Poorly-sited stations
 - Difficult data formats
 - Transcription errors



- ▶ Met garbage in = Plume garbage out



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The RASCAL Solution: MetFetch

- ▶ Developed for RASCAL V4.3
 - Radiological Assessment System for Consequence Analysis (RASCAL)
 - Used by the U.S. Nuclear Regulatory Commission's (NRC's) Operations Center to make independent dose and consequence projections during radiological emergencies
- ▶ What does MetFetch do?
 - Standalone application within the RASCAL “toolbox”
 - Retrieves meteorological observations and forecasts from the internet for use in RASCAL
 - The downloaded data can then be imported directly into RASCAL through the RASCAL interface
 - MetFetch has been used by the NRC staff since its release in Sept 2013 during exercises with good results

MetFetch Interface—Select Stations

The screenshot shows the NOAA Meteorological Data Downloader interface. The 'Search Criteria' section includes a file path, site latitude (35.31), site longitude (-93.231389), and a search radius of 100 miles (160 km). The 'Station Type' is set to 'NWS Stations Only'. A red box highlights the 'Select by Site Location' button. Below are two tables: 'Stations Available for Download' and 'Stations Download List'. The 'Stations Available for Download' table lists various stations with their IDs, types, states, and distances. The 'Stations Download List' table shows three selected stations: ARKA (NRC, VA, 006 miles), KRUE (NWS, NM, 009 miles), and KCCA (NWS, MS, 048 miles).

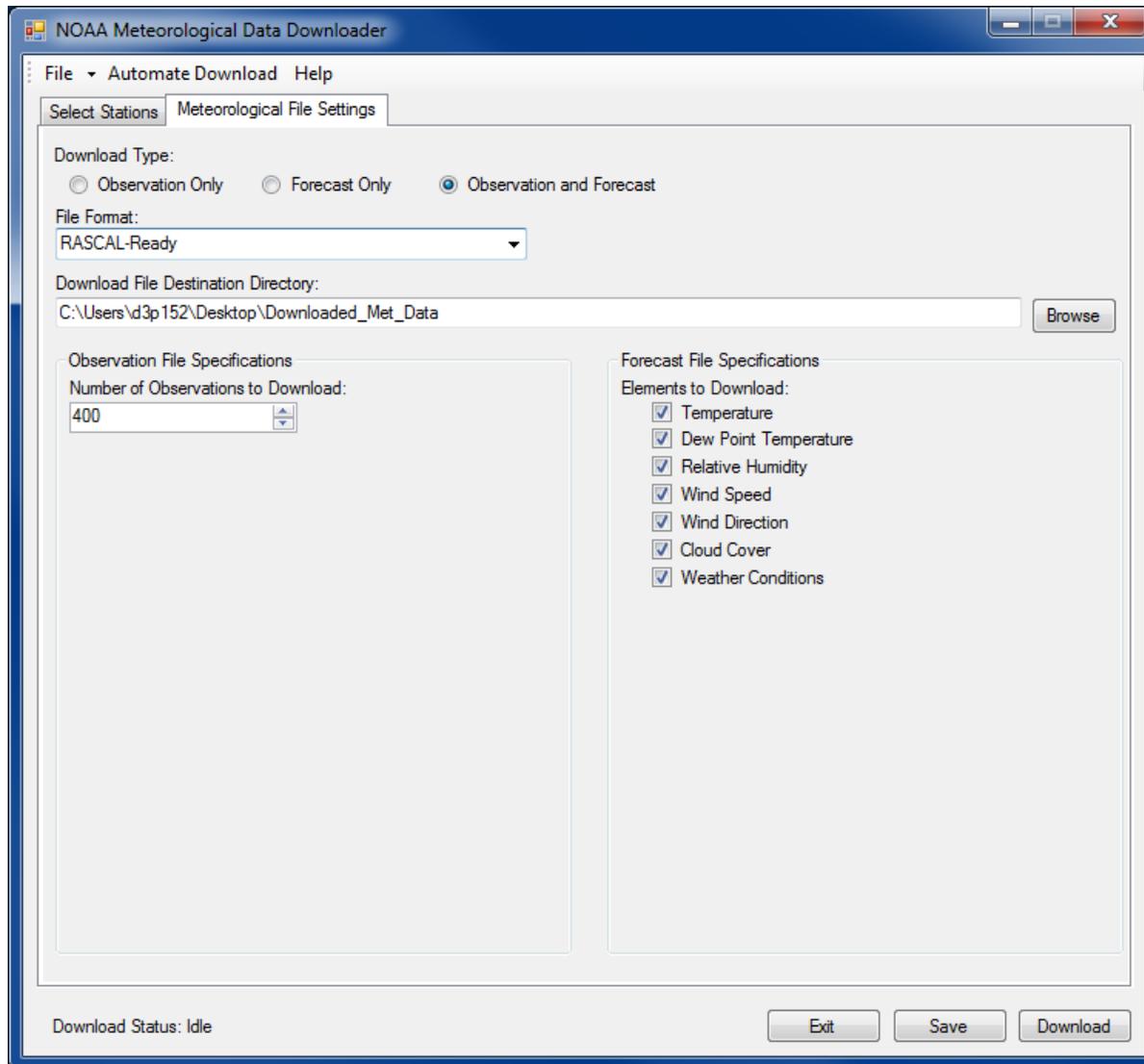
ID	Type	State	Distance
KMWT	NWS	CA	056 (miles) : SSW
KHOT	NWS	KY	058 (miles) : S
KFSM	NWS	OK	064 (miles) : W
KHRO	NWS	TX	066 (miles) : N
KLRF	NWS	TX	067 (miles) : ESE
KLIT	NWS	HI	069 (miles) : SE
KFYV	NWS	VA	072 (miles) : NW
KMEZ	NWS	CA	076 (miles) : SW
KASG	NWS	CO	078 (miles) : NW
KFLP	NWS	SC	078 (miles) : NNE
KRKR	NWS	TX	081 (miles) : WSW
KBBG	NWS	TX	084 (miles) : N
KM89	NWS	AL	084 (miles) : S
KBPk	NWS	WY	085 (miles) : NNE
KROG	NWS	NY	088 (miles) : NNW
KJSV	NWS	PA	089 (miles) : W
KXNA	NWS	FL	090 (miles) : NW
KVBT	NWS	CA	091 (miles) : NW

ID	Type	State	Distance
ARKA	NRC	VA	006 (miles) : S
KRUE	NWS	NM	009 (miles) : ESE
KCCA	NWS	MS	048 (miles) : ENE

The 'Select Site Location' dialog box displays a table of station data. The table has columns for Site Name, Site Code, City, State, Latitude, and Longitude. The 'Default' row is highlighted. Other rows include Advanced Medical Systems, North Anna, Arkansas Nuclear, Duane Arnold, Beaver Valley, Big Rock Point, and Braidwood.

Site Name	Site Code	City	State	Latitude	Longitude
Default					
Advanced Medical Systems	ADMS	Cleveland	OH	41.555	-81.561...
North Anna	ANNA	Mineral	VA	38.0608...	-77.790...
Arkansas Nuclear	ARKA	Russell...	AR	35.31	-93.231...
Duane Arnold	ARNO	Palo	IA	42.1005...	-91.777...
Beaver Valley	BEAV	Shippin...	PA	40.6219...	-80.433...
Big Rock Point	BIGR	Charlev...	MI	45.3591...	-85.194...
Braidwood	BRAI	Braidwo...	IL	41.2436...	-88.228...

MetFetch Interface—Meteorological File Settings



Importing MetFetch Data into RASCAL

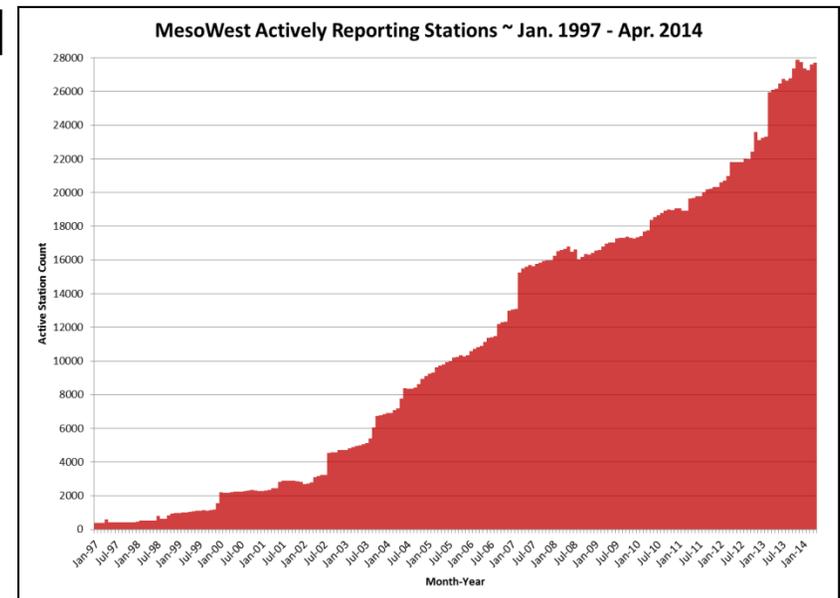
- ▶ Downloaded observation and forecast files are available to “retrieve” within RASCAL for a given reactor location.
- ▶ Data are used to create gridded fields for plume dispersion.

The screenshot shows the 'Meteorological Processor - Data Entry' window with the title 'Enter data for: Pasco, Tri-Cities Airport'. A table of station data is displayed, with a red box highlighting the columns 'Station ID', 'Type', 'Date', 'Time (24 h)', 'Wind Direct from (deg)', 'Speed (mph)', 'Stability Class', and 'Precipitation'. A red arrow points from this table to the 'Meteorological Field Display' window. The field display window shows a grid of wind vectors for a 100 mi x 50 mi area, along with maps for Stability, Precip Type, and Mixing Height. The Stability map shows a yellow area, the Precip Type map shows a green area, and the Mixing Height map shows a yellow area. The legend for Stability includes A, B, C, D, E, F, and G. The legend for Precip Type includes no precipitation, light rain, moderate rain, heavy rain, light snow, moderate snow, and heavy snow. The legend for Mixing Height includes heights in kilometers: < 0.2, < 0.4, < 0.6, < 0.8, < 1.0, < 1.2, < 1.4, < 1.6, < 1.8, < 2.0, and >= 2.0.

Station ID	Type	Date	Time (24 h)	Wind Direct from (deg)	Speed (mph)	Stability Class	Precipitation
WASH							
KALW	Obs	2014/06/17	05:53	230	8.0	Unknown	No Precip
KDLS	Obs	2014/06/17	06:53	220	9.0	Unknown	No Precip
KEAT	Obs	2014/06/17	07:53	240	10.0	Unknown	No Precip
KELN	Obs	2014/06/17	08:53	210	13.0	Unknown	No Precip
KEPH	Obs	2014/06/17	09:53	230	12.0	Unknown	No Precip
KGEG	Obs	2014/06/17	10:53	210	9.0	Unknown	No Precip
KHRI	Obs	2014/06/17	11:53	200	12.0	Unknown	No Precip
KLGD	Obs	2014/06/17	12:53	190	12.0	Unknown	No Precip
KLWS	Obs	2014/06/17	13:53	190	14.0	Unknown	No Precip
KMEH	Obs	2014/06/17	14:53	100	7.0	Unknown	Lgt Rain
KMWH	Fcst	2014/06/17	17:00	220	9.2	Unknown	Lgt Rain
KPDT	Fcst	2014/06/17	20:00	210	9.2	Unknown	Lgt Rain
KPSC	Fcst	2014/06/17	23:00	220	5.8	Unknown	No Precip
KPUW	Fcst	2014/06/18	02:00	210	6.9	Unknown	No Precip
KSKA	Fcst	2014/06/18	05:00	200	8.1	Unknown	No Precip
KSMP	Fcst	2014/06/18	08:00	210	11.5	Unknown	No Precip
KYKM	Fcst	2014/06/18	11:00	220	11.5	Unknown	No Precip

MetFetch Observations: MesoWest

- ▶ MesoWest provides access to current and archived weather observations across the United States
- ▶ Cooperative project between the University of Utah and the National Weather Service (NWS)
- ▶ Meteorological networks are managed by government agencies, private firms, and educational institutions.
- ▶ Rapid increase in actively reporting stations (~28,000)



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MetFetch Observations (Cont'd): MesoWest

- ▶ Observations are encoded in Extensible Markup Language (XML)
- ▶ Includes standard variables (temp, dew point, wind, precipitation, cloud cover, pressure)
- ▶ Format is predictable and repeatable
- ▶ Includes station quality flag to indicate “bad” data

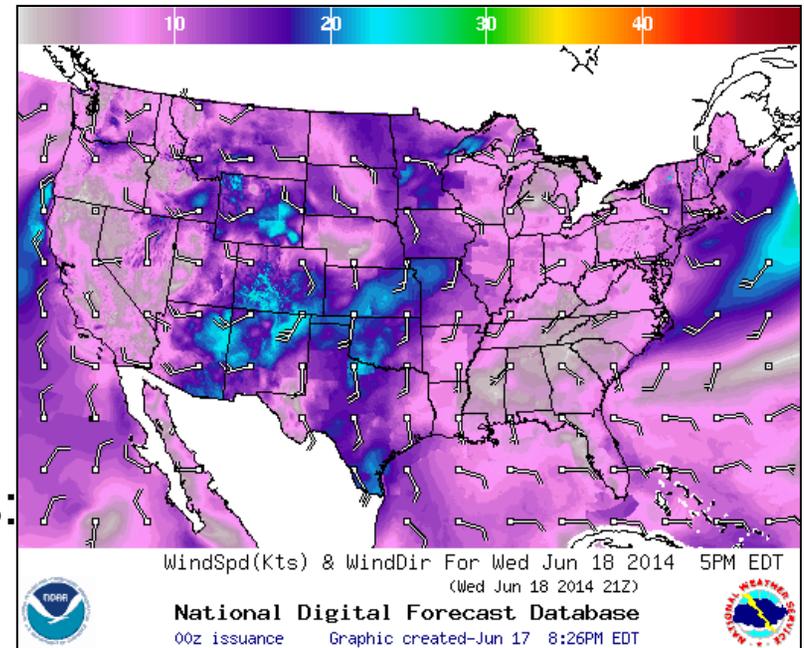


```
<?xml version="1.0" encoding="UTF-8" ?>
<station id="KRDU" name="Raleigh / Durham, Raleigh-Durham International Airport" elev="394"
lat="35.89223" lon="-78.78185" provider="NWS/FAA">
  <ob time="17 Jun 2:51 pm EDT" utime="1403031060">
    <variable var="T" description="Temp" unit="F" value="93"/>
    <variable var="TD" description="Dewp" unit="F" value="69"/>
    <variable var="RH" description="Relh" unit="%" value="46"/>
    <variable var="DD" description="Direction" unit="deg" value="-10"/>
    <variable var="DDCARD" description="Wind Card" unit="direction" value="VRBL"/>
    <variable var="FF" description="Wind" unit="mph" value="7"/>
    <variable var="VV" description="Visibility" unit="miles" value="10.00"/>
    <variable var="WEA" description="Weather" unit="" value="Partly Cloudy"/>
    <variable var="PRESWEA" description="Coded Weather" unit="" value=""/>
    <variable var="SKY" description="Clouds" unit="" value="SCT050TCU SCT250"/>
    <variable var="SLP" description="SL Pres" unit="mb" value="1018.8"/>
    <variable var="ALTSE" description="Altimeter" unit="inches" value="30.10"/>
    <variable var="P" description="Station Pressure" unit="inches" value="29.683"/>
    <variable var="STAQUAL" description="Station Quality" unit="" value="OK"/>
  </ob>
</station>
```

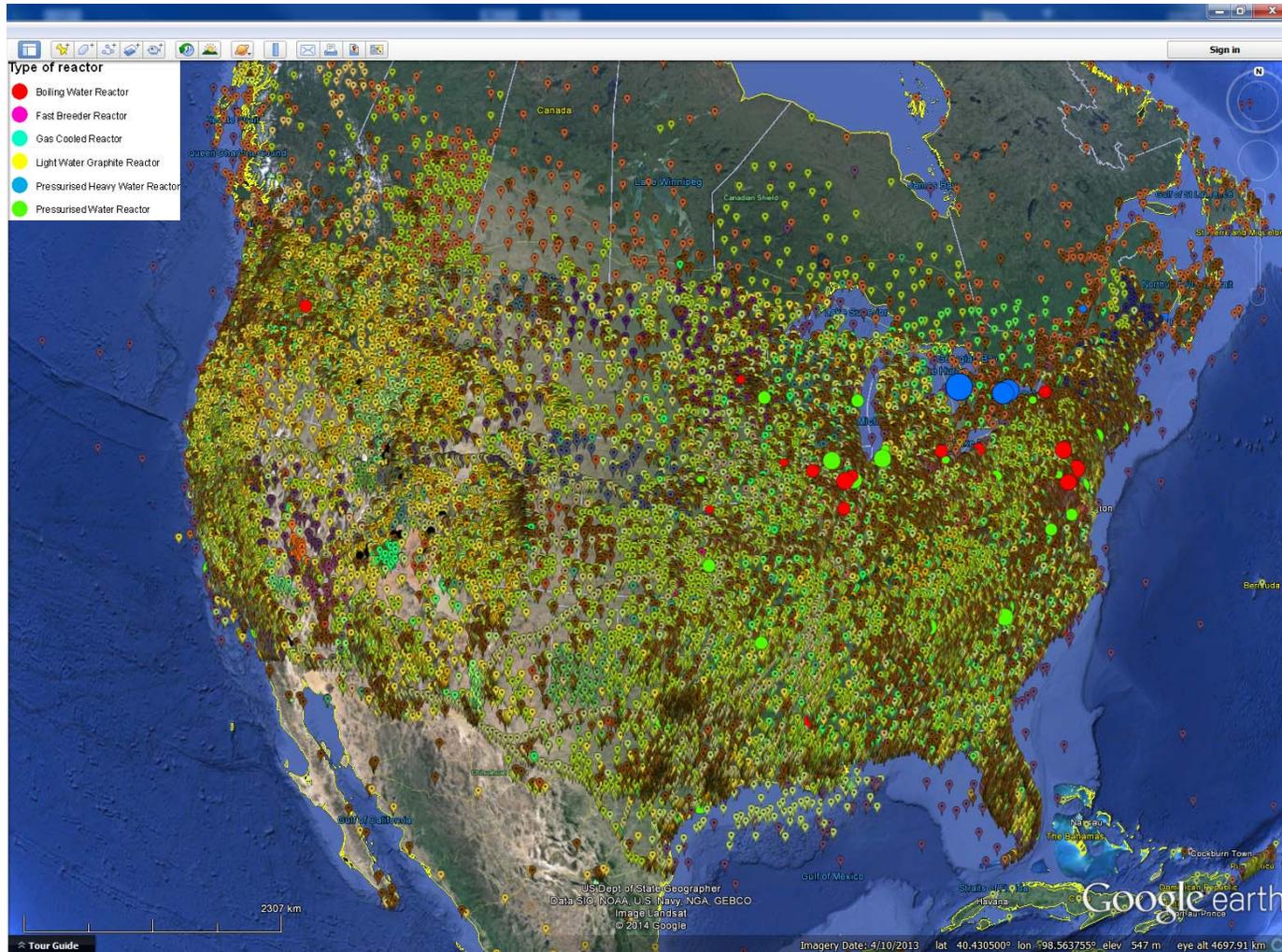
MetFetch Forecasts: NWS NDFD

- ▶ The National Weather Service (NWS) has developed the National Digital Forecast Data (NDFD) for disseminating their forecasts

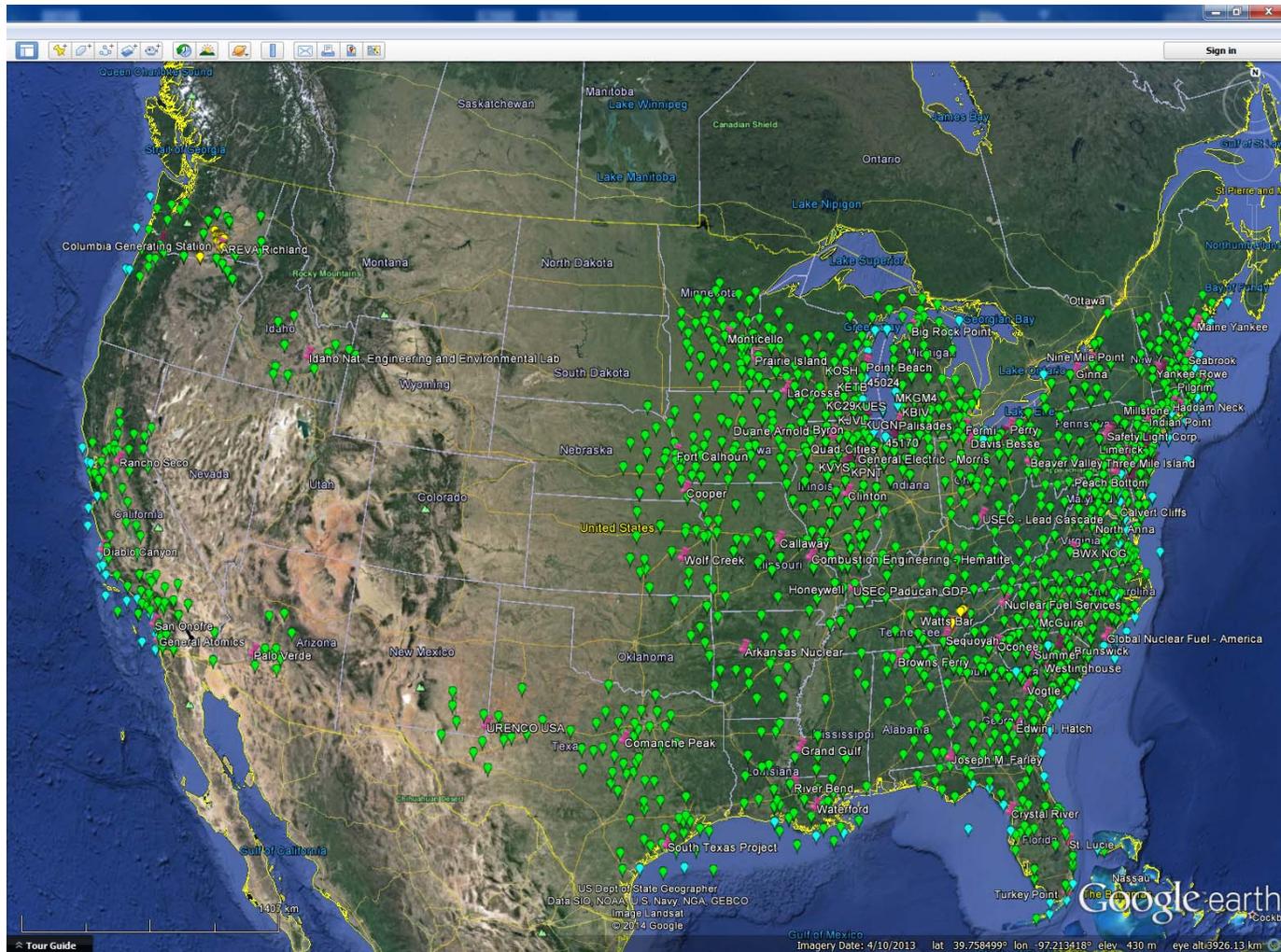
- Available to the public as a “web service”
- Includes standard forecast variables
- Spatial resolution is ~2.5 km
- Temporal resolution depends on variable; standard variables:
 - 3 hours out to 72 hours
 - Then 6 hours out to 168 hours
- Similar to observations, the forecast data are encoded in XML



Available Meteorological Networks/Stations



Available Meteorological Networks/Stations in RASCAL



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MetFetch V2.0

- ▶ Potential updates to MetFetch include:
 - Incorporating a map-based station selection option using GIS (MapWindows)
 - Allowing browsing of “all” meteorological networks
 - Reporting on station data and quality within the interface
 - Including the ability to generate RASCAL-ready surface roughness and terrain files
 - Customizing output file formats for other fast-running emergency response codes



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Questions?

▶ Contacts:

■ Jeremy Rishel

- Pacific Northwest National Laboratory
- Jeremy.rishel@pnnl.gov
- 509-375-6974

▶ How to obtain MetFetch (or RASCAL)

■ Google “NRC RASCAL”

- <http://www.nrc.gov/about-nrc/regulatory/research/safetycodes/rascal.html>



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MetFetch/RASCAL Sponsor

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