

Introduction to Weather Data Exchange and ITWS SWIM Feed



Federal Aviation
Administration

SWIM
Interactive Developer
Workshop 2016

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Overview

- Background on Weather Data Exchange
- Introduction to ITWS
- ITWS Data
- Data of Interest for Workshop (including representative schemas)

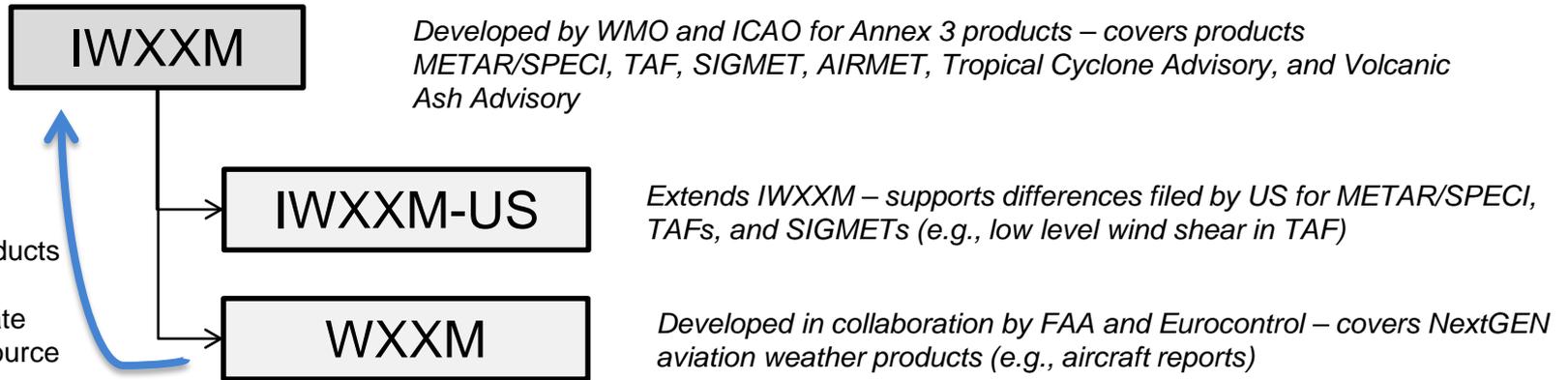


Importance of Weather Data to the NAS

- Weather accounts for approximately 70% of delay in the National Airspace System
- Weather data critical to understanding and predicting National Airspace System capacity
- Weather, leveraged with data from other SWIM feeds, can help to understand and mitigate delay in the National Airspace System

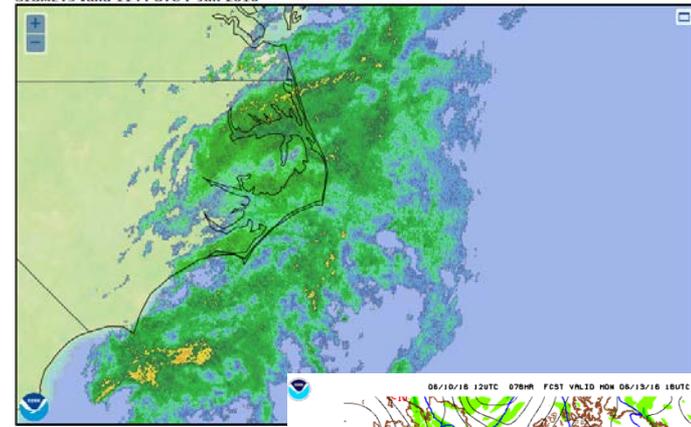
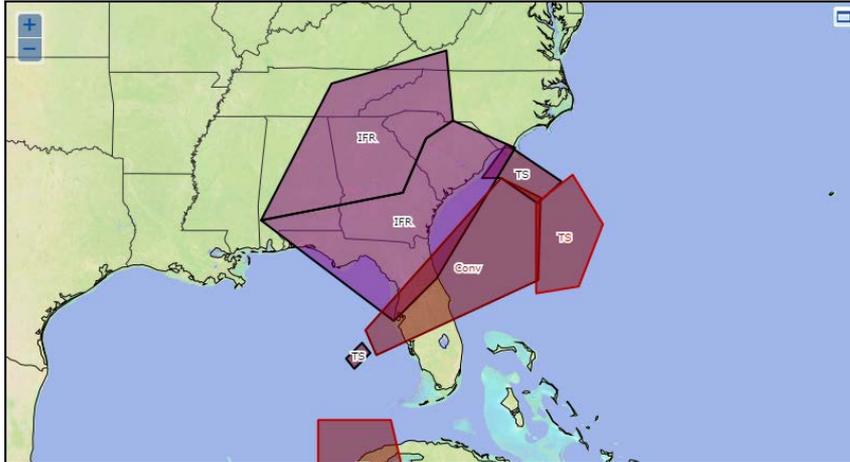
Weather Exchange Models

- Exchange of weather data poses a unique set of challenges to data exchange, these challenges include:
 - Many different types of weather products
 - Differences in “shared” products across international community
 - Products developed for particular country (e.g., CCFP)
- Number of weather schemas, all serving a different purpose for exchange of weather data (help to address these challenges)



Types of Weather Data

SIGMETs valid 1139 UTC 7 Jun 2016



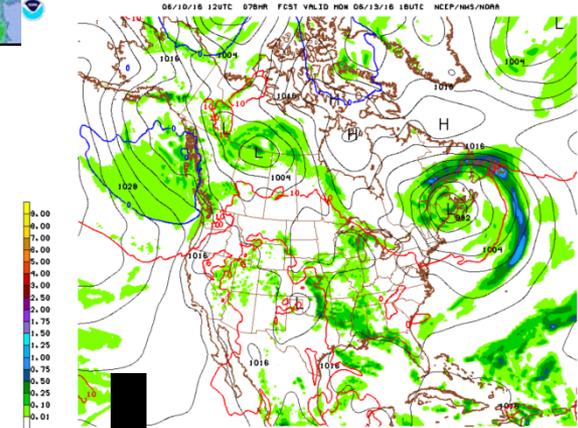
IDs: Format: Raw Decoded Include TAF

Data at: 1753 UTC 07 Jun 2016
KIAD 071652Z 31010KT 10SM FEW065 SCT110 28/14 A2957 RMK A02 SLP012 T02830139

KIAD 071735Z 0718/0824 29011G19KT P6SM VCSH BKN060
FM072200 30014G22KT P6SM SCT060
FM080200 31010KT P6SM SCT080
FM080700 29006KT P6SM SCT250
FM081200 28010G18KT P6SM BKN060
FM081400 29017G29KT P6SM BKN050
FM082200 30015G25KT P6SM SCT050



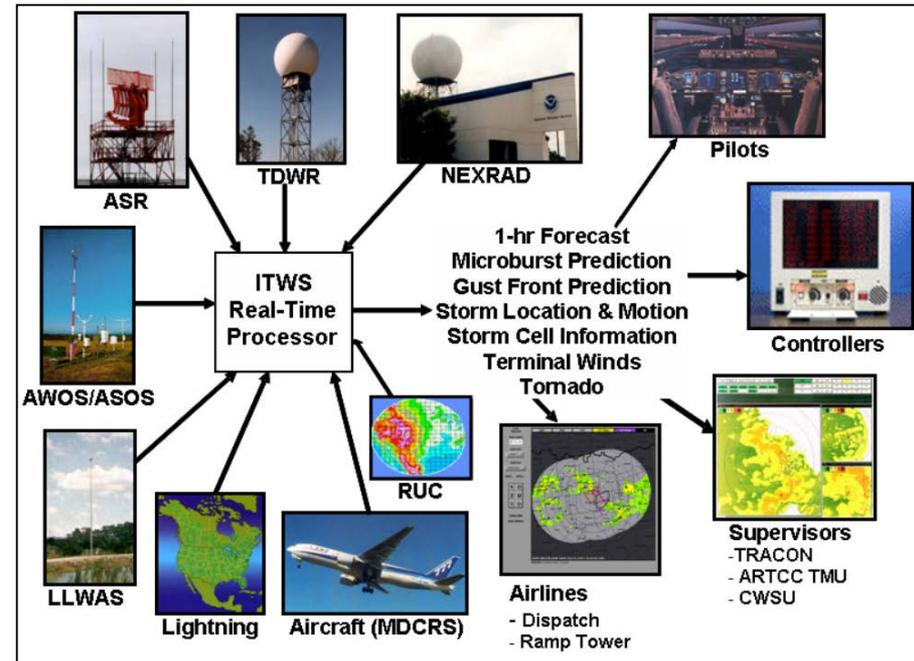
Non-gridded (exchanged via XML/GML)



Gridded (typically exchanged via NetCDF, GRIB)

Integrated Terminal Weather System (ITWS) Overview

- Provides fully automated terminal weather information to aviation stakeholders
 - Integrates data from many systems to create unique, value-added products
- ITWS data sets primarily include:
 - Wind shear products
 - Storm products
 - Other



Source: <https://www.ll.mit.edu/mission/aviation/faawxsystems/itws.html>

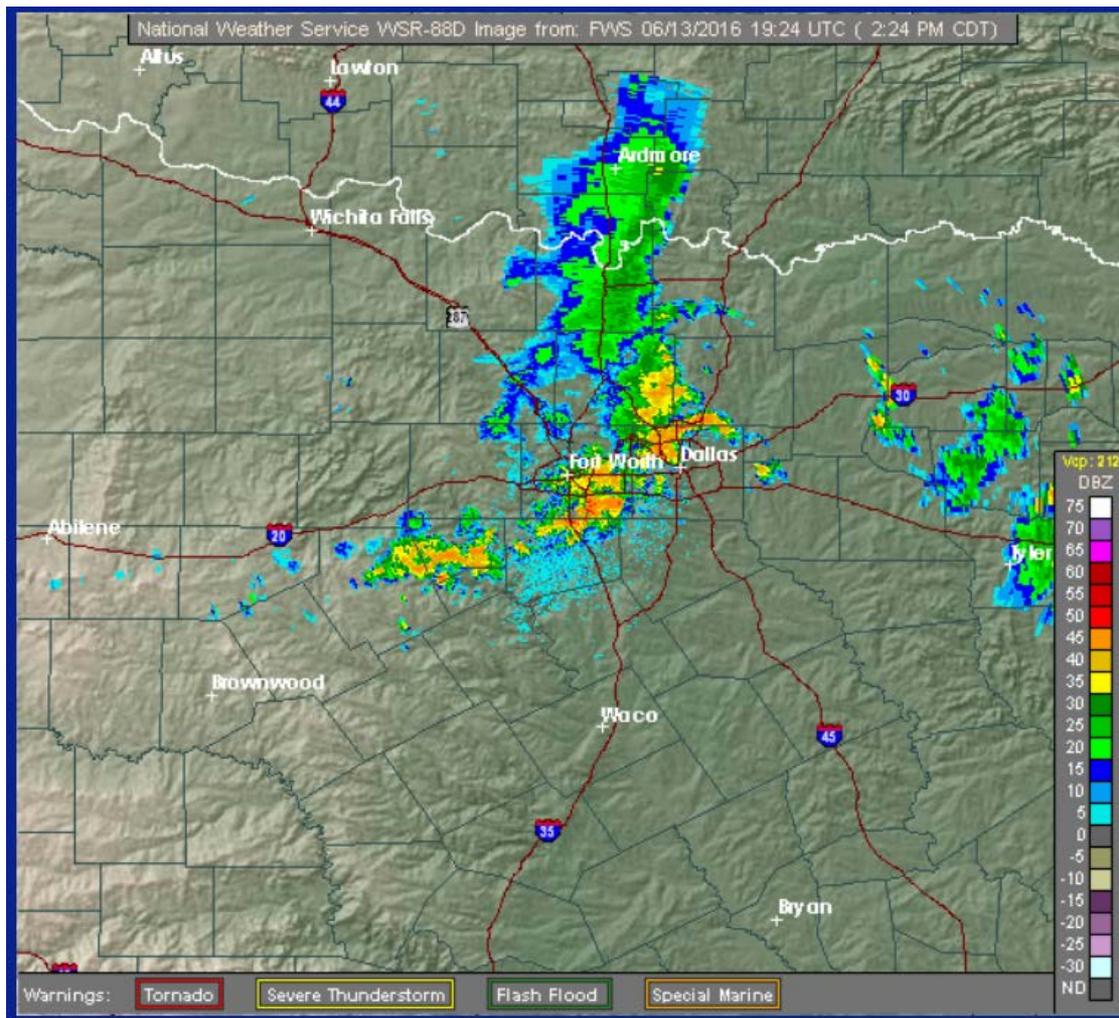
ITWS Data via SWIM

- ITWS provides weather information in both graphic (gridded) and textual formats (non-gridded)
- ITWS weather data available via SWIM compliant JMS or SOLACE pub/sub capabilities
 - Destination names: *ITWS.IN* and *ITWS_ALERT.IN*
- Graphical data is encoded using simple run length encoding
 - Users may want to convert these products into NetCDF or GRIB

ITWS Data

- Configured Alerts
- Forecast
 - Accuracy
 - Contour
 - Image
- TRACON Map
 - Microburst
 - Gust Front
- Precipitation
 - 5nm
 - TRACON
 - Long Range
- Hazard Text
 - 5nm
 - TRACON
 - Long Range
- Storm Motion Storm Extrapolated Positions
 - 5nm
 - TRACON
 - Long Range
- Tornado Alert Product
- Tornado Detection Product
- Anomalous Propagation (AP)
 - Indicated Precipitation
 - AP Status
- Gust Front Estimated Time to Impact
- Terminal Wind Profile
- ITWS Status Information
- Automatic Terminal Information Service (ATIS)
 - Microburst
 - Windshear
- Runway Configuration
- Terminal Weather Text Normal/Special

DFW Convective Event – June 13, 2016



ITWS Product Header Information

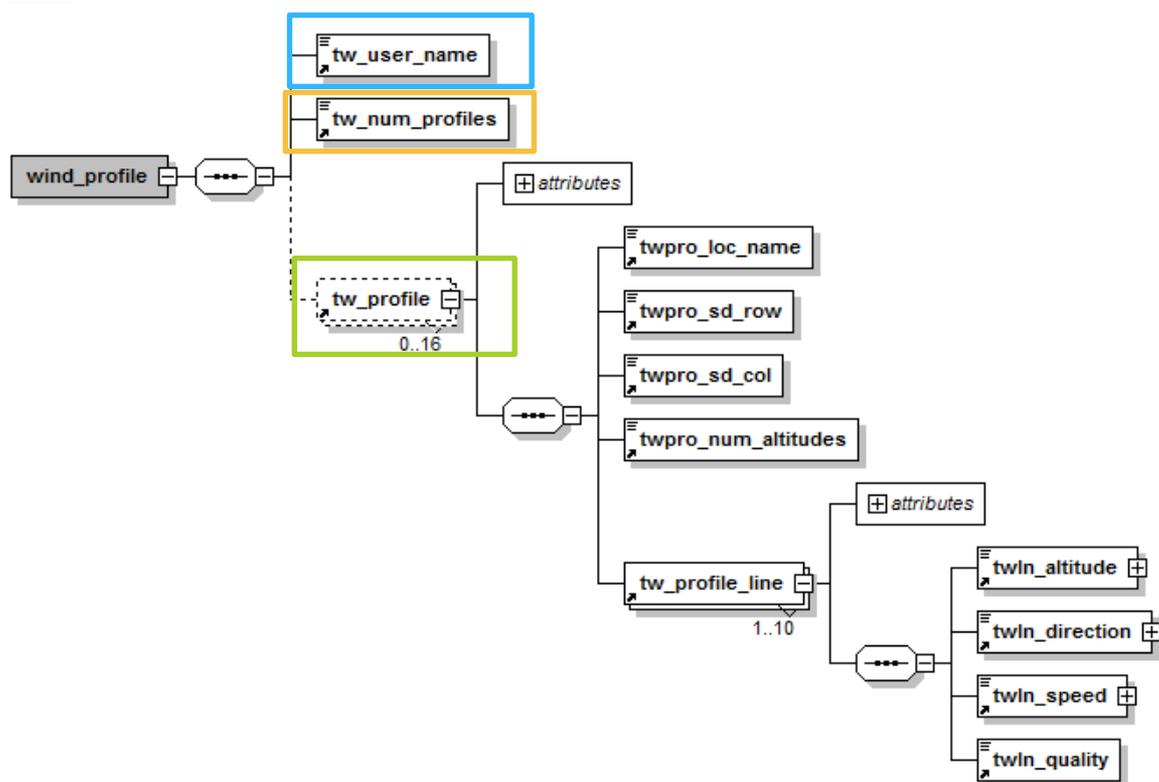
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</product_header>
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•Every ITWS product/message contains product header information. This information includes:

- ITWS Site
- Airport
- Generation time**
- Expiration time**

Terminal Wind Profile Product

The Wind Profile Product provides wind direction and speeds at different altitudes for pre-configured locations associated with an airport.



Name of airport for which terminal wind profiles apply



Header defining number of profiles to follow (could be 0 to 16 profiles)



Structure containing data from each profile

Terminal Wind Profile Product

```
<wind_profile>
  <tw_user_name>DFW</tw_user_name>
  <tw_num_profiles>15</tw_num_profiles>
  <tw_profile count="1">
    <twpro_loc_name>UKW</twpro_loc_name>
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```

← Applicable Airport

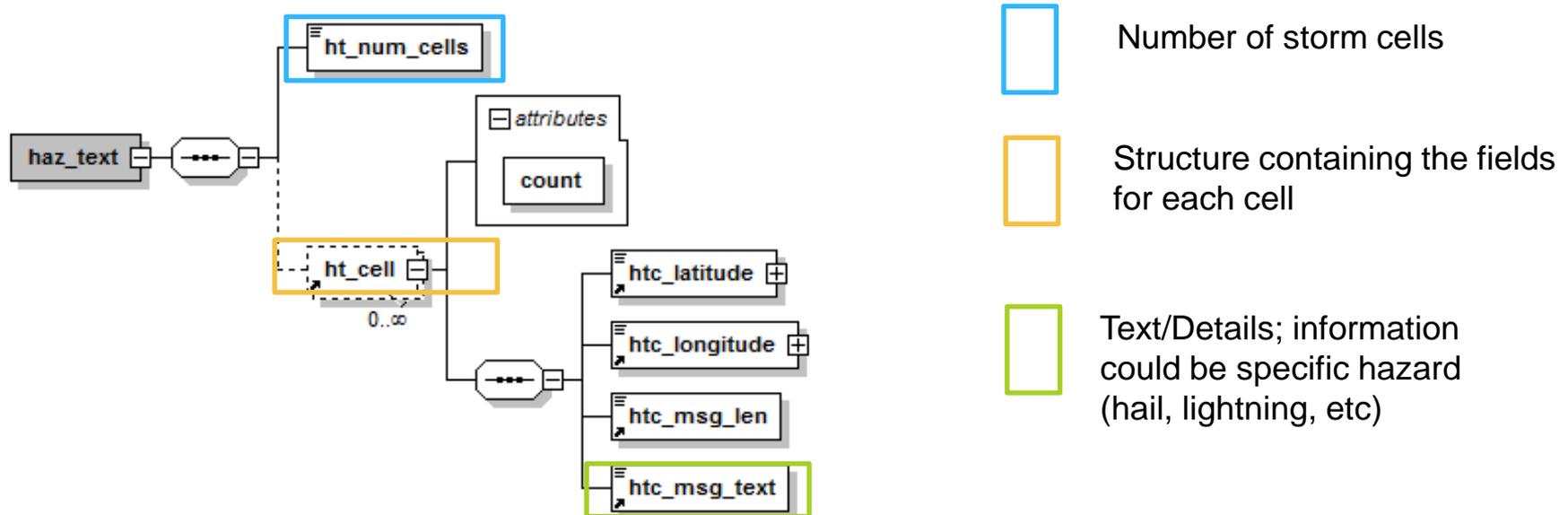
← Number of Profiles

← Profile name (i.e., fix)

← Number of Altitudes

Hazard Text Products (5nm)

Hazard Text product is associated with the Precipitation Product and contain the text warning messages for each identified storm cell in the respective Precipitation Product



Hazard Text Products (5nm)

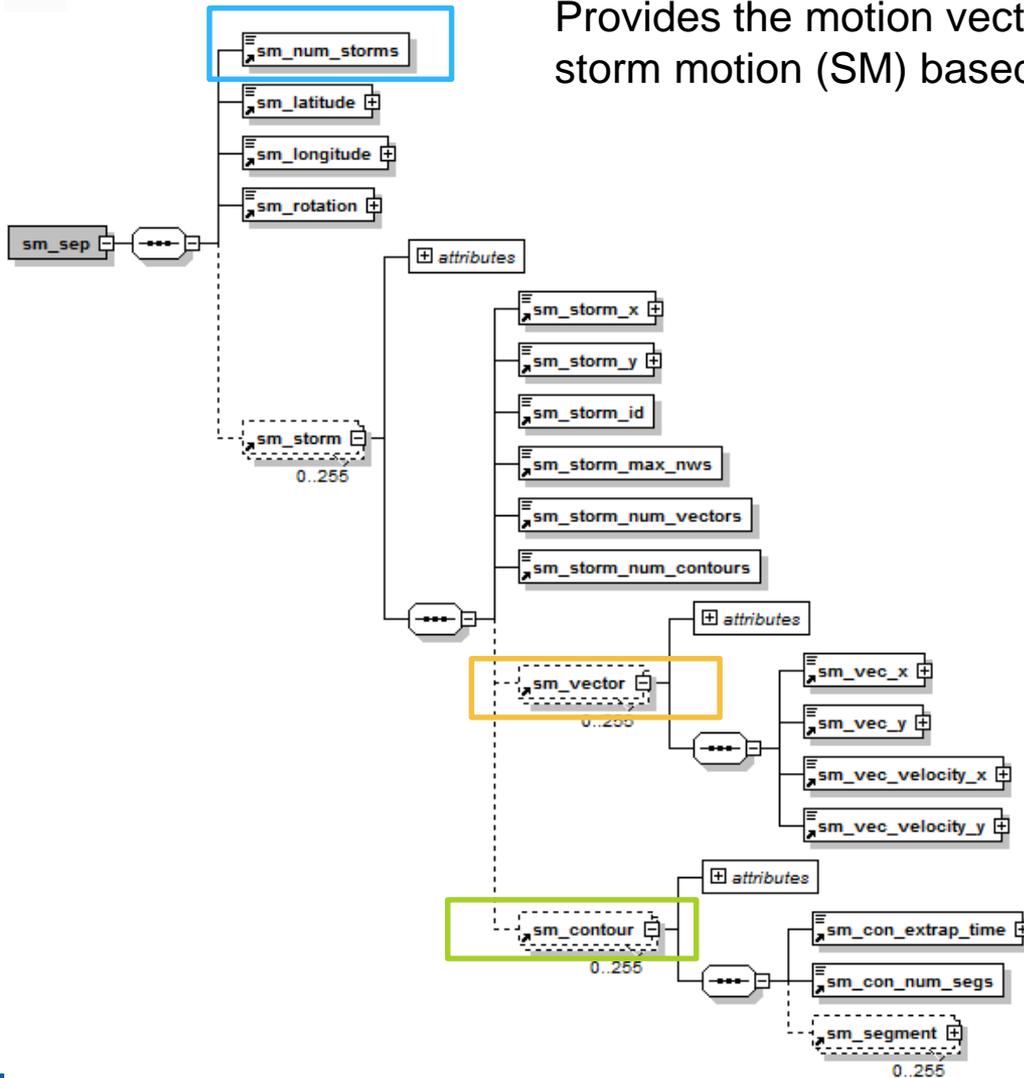
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    <htc_longitude unit="degrees">-97.060104</htc_longitude>
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    <htc_msg_text>LIGHTNING
ECHOTOP: 500
  </htc_msg_text>
</ht_cell>
  <ht_cell count="2">
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ECHOTOP: 400
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</ht_cell>
</haz_text>
```

Number of storm cells in text (indicated by precipitation product)

Location of storm cell, hazard information

SM SEP Products

Provides the motion vectors and extrapolated positions showing storm motion (SM) based on their respective Precipitation Product



Number of storm cells



Storm Motion vector information

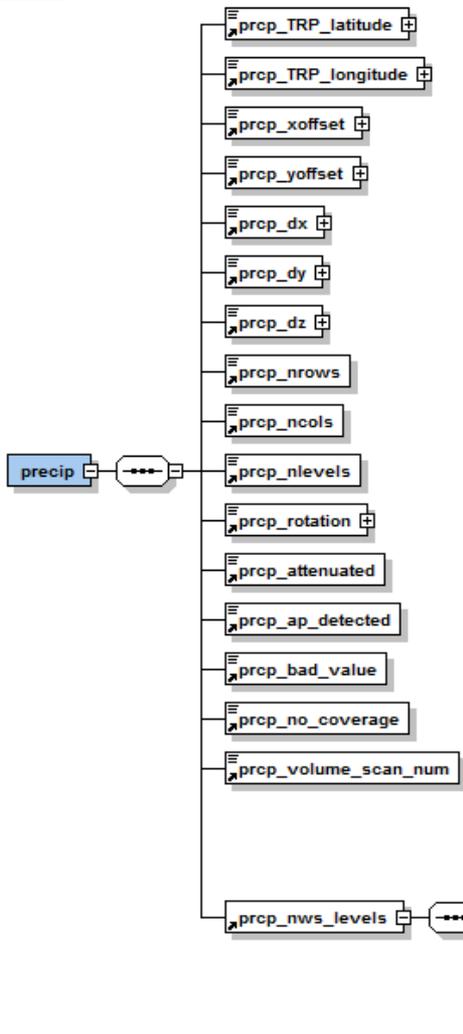


Storm Motion contour information

Precipitation Products

Shows the 6-level NWS data from TDWR, ASRs, or NEXRAD

Run Length Encoding used to compress grid



```

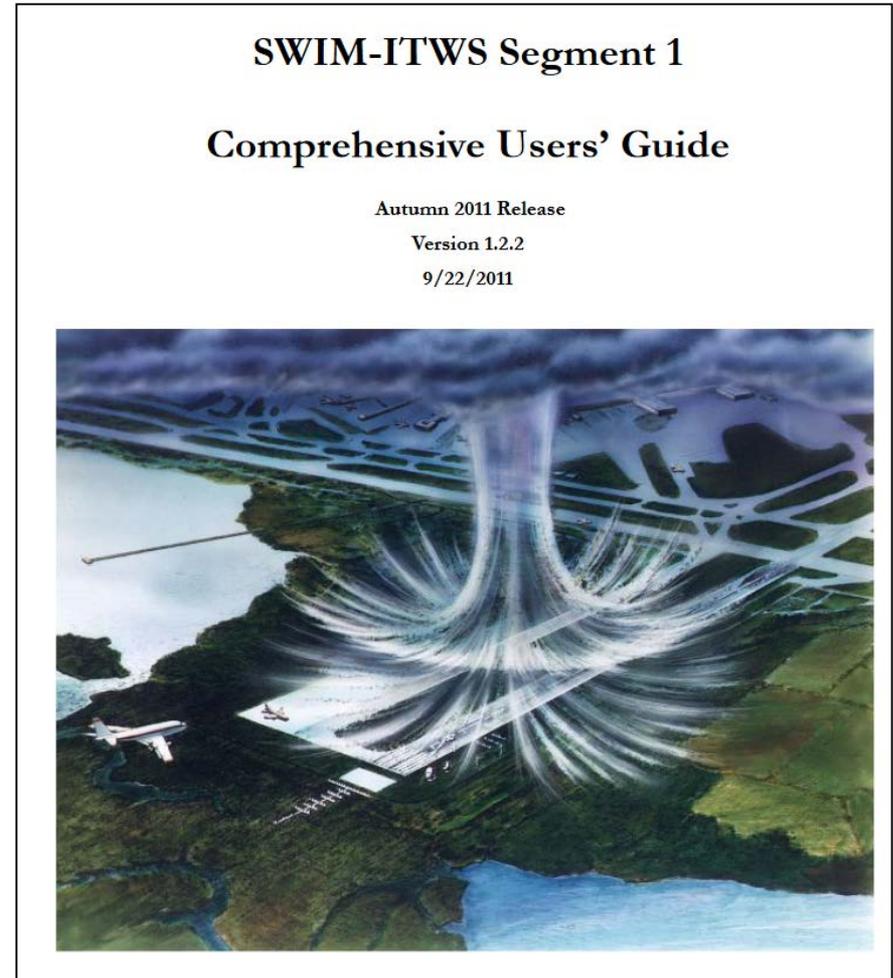
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  <prcp_grid_compressed>15,2268 0,24 15,209 2,5 0,33 15,197 2,11 0,37 15,188 2,12 1,3 0,41 15,180 2,16 1,3 0,45 15,173 2,19
  2,31 1,8 0,63 15,136 2,36 1,3 0,67 15,132 2,38 0,72 15,128 2,40 0,74 15,125 1,1 2,41 0,74 15,122 0,1 1,3 2,40 1,2 0,74 15,118 0,3 1,7 2,1
  1,1 2,7 1,2 0,65 15,105 0,10 1,1 0,2 1,1 0,2 1,2 2,25 8,7 1,3 0,6 2,11 0,66 15,102 0,16 1,4 2,22 8,9 1,6 0,3 1,1 2,11 0,68 15,99 0,16 1,3 2,
  2,2 1,4 2,10 1,2 0,72 15,90 0,19 1,3 2,15 8,19 2,6 1,2 2,14 0,74 15,87 0,20 1,2 2,14 8,20 2,13 3,5 4,2 8,3 2,1 1,1 0,73 15,85 0,20 1,2 2,14
  
```



Resources

- NSRR contains information to help user community become familiar with ITWS product formats and access to the data via SWIM

https://nsrr.faa.gov/sites/default/files/SWIM-ITWS_S1_ComprehensiveUG_Autumn_2011_v1.2.2.pdf



Questions?

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