Working Group/Observational Data
Fall 2016

Co-Chairs:

Mr. Kyle Rushing, NAVO

Mr. Vincent Tabor, NOAA/NESDIS

Presenter:

Mr. Eric Wise, HQ/USAF A3W

Exec. Secretary:

Mr. Anthony Ramirez, OFCM

Overview

- Scope of Responsibility
- Members
- Ongoing Activities
- Action Items
- Upcoming Activities

Scope of Responsibility

Facilitate the acquisition, processing, exchange, and management of observational data and metadata among the Federal Agencies, National Operational Processing Centers (OPCs), the World Meteorological Organization, and other related data centers. Primary focus areas:

- Meteorological, Oceanographic, and Space environmental data and metadata
- Provide an interface between the OPCs, their research and development partners in the Joint Center for Satellite Data Assimilation (JCSDA), and the other national data and prediction centers for the purpose of coordinating and satisfying national requirements for observational data
- Coordinate data formatting standards where practical and the implementation of approved data product enhancements and new data products
- Coordinate observational data issues that overlap related responsibilities of other OFCM committees and groups
- Ensure the OPCs and related data centers are provided the maximum quality and optimum quantity of observational environmental data streams required for assimilation into their respective processes

Member Agencies/Entities

NOAA

- National Environmental Satellite, Data, and Information Service/Office of Satellite and Product Operations (NESDIS/OSPO), Suitland, MD
  - National Centers for Environmental Information (NCEI)
    - Center for Weather and Climate (CWC) (formerly NCDC)

- National Weather Service (NWS), Silver Spring, MD
  - National Centers for Environmental Prediction (NCEP), College Park, MD
    - Environmental Modeling Center (EMC)
    - NCEP Central Operations (NCO)
      - NCO-Silver Spring (formerly Telecommunications Operations Center (TOC))
    - Space Weather Prediction Center (SWPC)
  - Office of International Affairs
  - Office of Observations
    - National Data Buoy Center (NDBC)
  - Office of Dissemination

- Office of Oceanic and Atmospheric Research (OAR)

Member Agencies/Entities

Air Force

- HQ AF/A3W, Pentagon, Washington DC
- Air Combat Command (ACC)
  - 557th Weather Wing, Offutt AFB, NE
    - 14th Weather Squadron, Asheville, NC

Navy

- Fleet Numerical Meteorology and Oceanography Center (FNMOC), Monterey, CA.
- Naval Oceanographic Office (NAVOCEANO), Stennis Space Center, MS
- Naval Research Laboratory-Marine Meteorology Division, Monterey CA.

Joint Center for Satellite Data Assimilation (JCSDA) (Headquarters), College Park, MD

The U.S. Integrated Ocean Observing System (IOOS)

WG/Observational Data

Co-Chairs	Mr. Kyle Rushing, NAVO Mr. Vincent Tabor, NOAA/NESDIS
NOAA **NESDIS** -- OSPO -- NCEI/CWC **NWS** -- NCEP/EMC -- NCEP/NCO -- NCEP/SWPC -- Office of Intnl. Affairs -- Office of Observations --- NDBC -- Office of Dissemination **OAR**	 Mr. Vincent Tabor Vacant Mr. Jeffrey Ator Mr. Dennis Keyser and Mr. Christopher Hill Mr. Walter Smith Vacant Mr. Fred Branski Ms. Alix Rolph Mr. Rex Hervey Mr. Robert Bunge Dr. Stephen Piotrowicz
JCSDA	Dr. James Yoe
IOOS	Mr. Derrick Snowden

WG/Observational Data

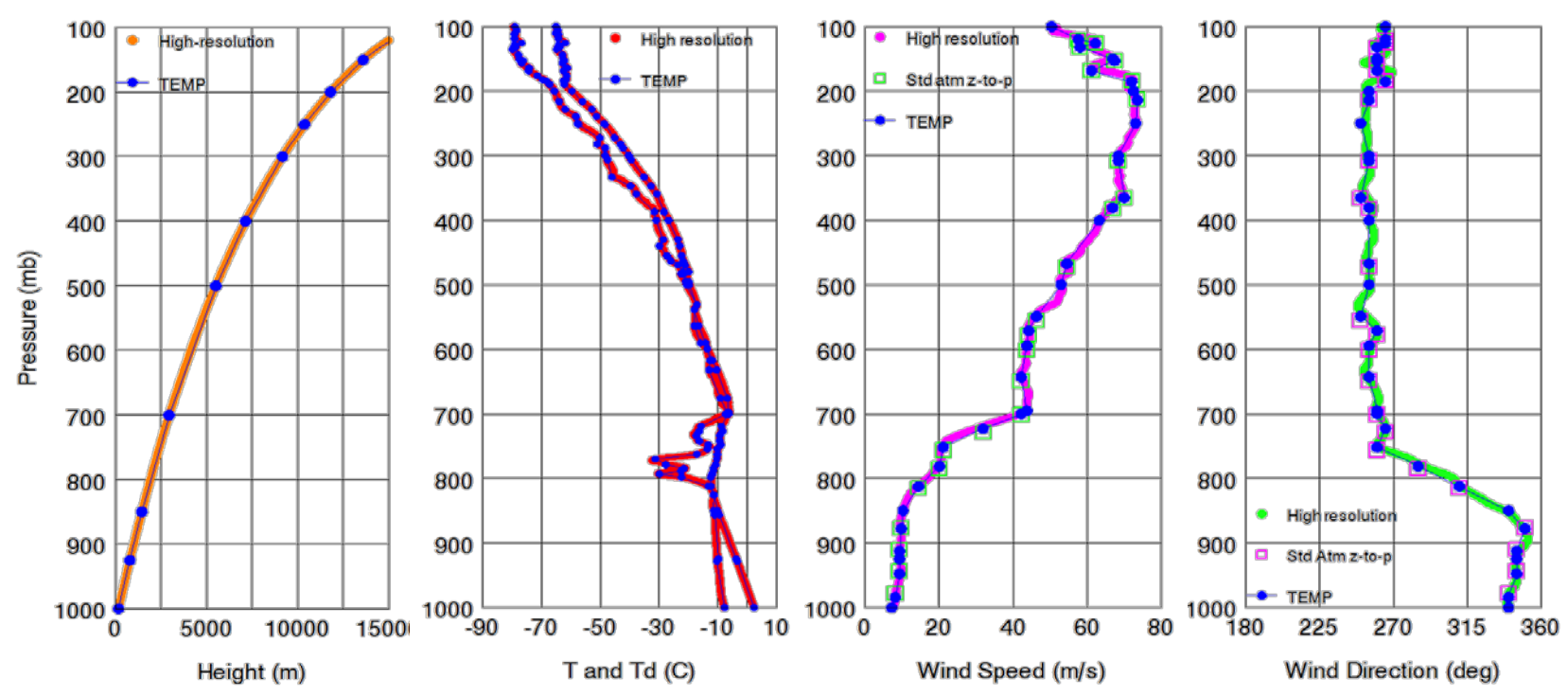
NAVY	
NAVO	Mr. Kyle Rushing Mr. Keith Willis
FNMOC	Mr. James Vermeulen Dr. Justin Reeves
NRL	Dr. Patricia Pauley
AIR FORCE	
HQ Air Force/A3W	Mr. Eric Wise
557th Weather Wing **--14th Weather Sq.**	Mr. Mark Surmeier Mr. Randy Haeberle
OFCM Exec. Secretary	Mr. Anthony Ramirez

Ongoing Activities

Interagency implementation of WMO data management procedures

- BACKGROUND:
  - Two overlapping & concurrent WMO migrations
    1. WMO is migrating from Traditional Alphanumeric Code (TAC) forms to Binary Universal Form for the Representation of meteorological information (BUFR)
    2. WMO is implementing WIGOS and OSCAR/Sfc (from pub 9 vol A)
  - OPCs are experiencing complicated migrations and have been responding to issues as they arise.
- TAC distribution was SCHEDULED to end in November 2014, but…
  - U.S. and other Countries are turning TAC off asynchronously
  - TAC data counts will diminish as countries discontinue TAC distribution
  - If production centers do not have replacement BUFR products, we could experience negative impacts on model skill.
  - OPCs need to temporarily use BOTH TAC and BUFR data
  - WMO will no longer approve any changes to or additions of TAC code

The Promise of BUFR



Non-operational high-resolution sounding for 72305 (Newport, NC) at 2015010800

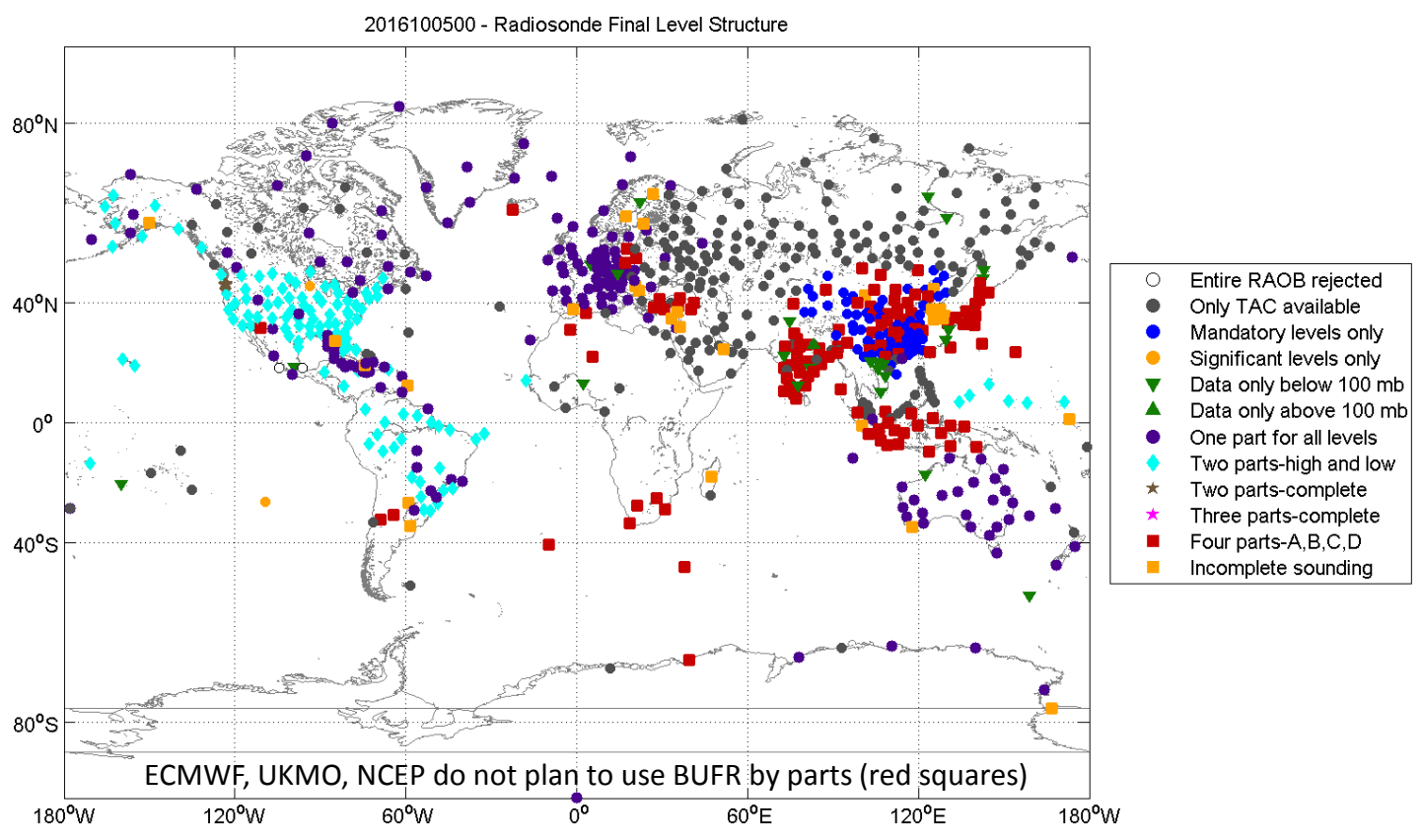
BUFR: 1-sec (~5 m) data with balloon drift, all variables at all levels

- 6373 levels from 1020 mb to 9.8 mb
- Similar to operational soundings from Europe

TAC (TEMP): mix of mandatory and significant mass/wind levels

- 16 mandatory, 120 significant mass, 36 significant wind levels

The Reality of BUFR



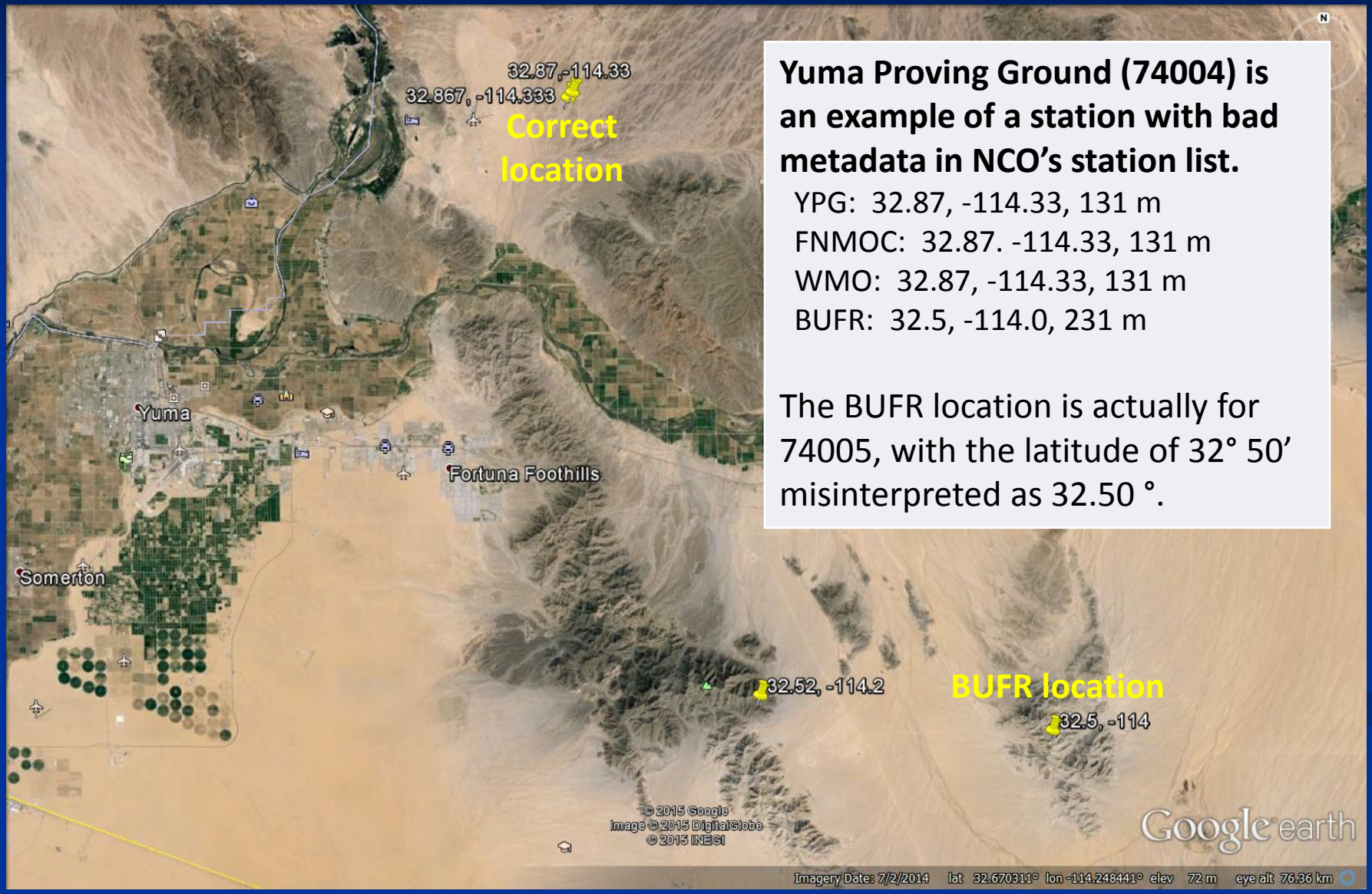
Structure of BUFR radiosonde data received at FNMOC

- "Proper" BUFR—one message containing the full sounding (purple dots)
- "BUFR by parts"—one message for each of the four TEMP parts (red squares)
- NCO's "legacy" TUABUFR uses BUFR by parts, as do China, Japan, India, etc.
- NCO's BMT BUFR provides multiple messages for the U.S., some of which are proper BUFR

Examples of Data Errors

- Errors arising from decoding TAC prior to encoding in BUFR
- Other errors/problems in BUFR from TAC
  - Missing information
  - Incomplete BUFR soundings with data filled in from TAC
  - Failure to convert degrees-minutes-seconds to decimal degrees
  - Sign error in longitude
  - Confusion between Hp and Hha elevations
  - Many errors reported last year have been corrected

Metadata Error Example



Yuma Proving Ground (74004) is an example of a station with bad metadata in NCO's station list.

YPG: 32.87, -114.33, 131 m
FNMOC: 32.87. -114.33, 131 m
WMO: 32.87, -114.33, 131 m
BUFR: 32.5, -114.0, 231 m

The BUFR location is actually for 74005, with the latitude of 32° 50' misinterpreted as 32.50 °.

BUFR Migration Monitoring and Collaboration

- FNMOC, NRL, NAVO, NCEP, AF/A3W – Metadata Subgroup
  - Weekly conference calls continue – very active since January 2015
  - Consulting with NCEP to fix data conversion problems related to BMT conversions
  - On May 03 2016, Meteo-France intended to terminate distribution of FM-18 (TAC) buoy data in favor of BUFR.

    -- Globally, not all OPCs are fully prepared for this transition – Meteo-France granted an extension of transmission/distribution of TAC bulletins until Nov 01, 2016.

WIGOS and OSCAR/Sfc

- WMO Integrated Global Observing System (WIGOS)
  - Future observing framework in support of weather, climate, water and relevant environment services; a WMO priority
- Observing Systems Capability Analysis and Review tool (OSCAR)
  - Two components: OSCAR/Surface and OSCAR/Space
  - OSCAR/Surface includes station metadata: information historically in WMO Publication 9, Volume A: Observing Stations and WMO Catalogue of Radiosondes (the WMO stations catalog)
  - OSCAR/Surface became operational replacement for Vol. A in May 2016
    - Vol. A look-a-like to be produced from OSCAR/Surface during 2-year transition
    - Initial population from Vol. A had some errors and omissions that need correction
    - GUI is not user-friendly; NCEP/NCO developing templates to gather requisite info
    - Traditional WMO station IDs will transition to much longer WIGOS IDs – potentially complicated software changes will be necessary.

- Interagency Implementation of WIGOS and OSCAR/Sfc
  - WG/OD subgroup for conventional data met with NWS Office of Observations and Office of International Affairs
  - U.S. focal point for WIGOS: NWS Office of Observations/Kevin Schrab
  - Interim U.S. focal point for OSCAR/Sfc: NCEP-NCO/Mr. Walter Smith
    - Establishment of Air Force sub-focal point being coordinated
- WG/OD Terms of Reference being revised to include
  - Interagency management of WMO data standards and procedures
  - Interagency management of metadata
  - Add membership: NWS Offices of International Affairs, Observations, and Dissemination

Action Items

2015-2.1 Finalize development of and implement the OPC-consolidated, spreadsheet(s) to report and track data errors and other significant data related problems

- Share/compare data and metadata error discoveries and track to final fix
- Includes priorities that include impact to models/operations

OPR: FNMOC/NRL , AF 557th, NWS/NCEP/NCO, NWS/Office of Observations

Status: Closed (first step in 3-action item process)

Tools Add-ons Help Last edit was on March 16

Arial 12

	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
	Upper Air	Surface	WMO Latitude	WMO Longitude	WMO Elevation (meters)		WMO VolA Date	Discovery	Priority	Reporting OPC	Reporting Official	Date reported to NCO-SS	NCO-SS ticket number	Site Survey Data (see next tab)
			(Decimal deg)	(Decimal deg)	(Hp-station barometer)	(Hha-ground height)	(MM/DD/YYYY)	(description--Note that the NWS/NCDC values referenced here were extracted from high-resolution radiosonde BUFR files archived at NCDC by Jeff Ator.)	(High/Med/Low)	(FNMOC/AFWA/NCEP)	(name)	(MM/DD/YYYY)		latitude, longitude, barometer height, radiosonde release height, date provided
	X		40.8656 (40.8650)	-72.8647 (-72.8628)	26.2	19.6	7/27/2015 (1/14/2016)	This station appears to use Hha as the reference elevation rather than Hp. Hha agrees with the NWS/NCDC elevation of 20 m. BUFR uses 26 m for the elevation. (1/14/16--PMP: The WMO metadata changed slightly, but the question of reference elevation remains.)	Med	FNMOC/NRL	Dr. Pat Pauley (NRL)	(Added to spreadsheet on 9/3/2015)		40.86513076 -72.86285885 26.189 m 19.597 m (11/12/2015)
	X		42.6925 (42.6919)	-73.8322 (-73.8322)	89 (92)	93 (95)	2/10/2015 (7/27/2015) (1/14/2016)	BUFR radiosonde data appears to use the surface station location at the airport (42.75,-73.80) instead of the upper-air location at the NWS office (42.69214,-73.83264), which agrees with the NWS/NCDC station list. The BUFR elevation is 89 m agreeing with Hp, but the Hha elevation of 93 m appears to be more consistent with hydrostatic estimates and with the NWS/NCDC elevation of 95 m. (9/3/15: PMP verified that BUFR uses 42.75, -73.80, 89 m.) (1/14/16--PMP: The WMO metadata changed slightly but there is still some question about which reference elevation to use.)	High	FNMOC/NRL	Dr. Pat Pauley (NRL)	1/23/2015	140709-0163 (ticket closed)	42.69213889 -73.83263889 92.169 m 95.409 m (11/12/2015)
	X		42.6975 (42.6989)	-83.4711 (-83.4714)	321.3 (321)	330.2 (330.2)	1/26/2015 (7/27/2015) (1/14/2016)	This station appears to use Hha as the reference elevation rather than Hp. Hha agrees with the NWS/NCDC elevation of 330 m. BUFR uses 321 m for the elevation. (1/14/16--PMP: The WMO metadata changed slightly, but the reference metadata question remains.)	Med	FNMOC/NRL	Dr. Pat Pauley (NRL)	1/22/2015	140709-0163 (ticket closed)	42.69914641 -83.47160353 321.29 m 330.226 m (11/12/2015)
	X		44.0728	-103.2108	1031	1029	1/26/2015 (7/27/15)	WMO metadata with Hha used for station elevation are close to the NWS/NCDC values (44.07301, -103.21027, 1029 m). The WMO location is correct, but the BUFR latitude is incorrect (44.6667 instead of 44.0728) leading to a position error of over 60 km. (4/29/15: PMP verified that BUFR uses 44.6667, -103.2, 1031 m.) (1/14/16--PMP: The WMO metadata are unchanged from July, but the BUFR latitude is still incorrect.)	High	FNMOC/NRL	Dr. Pat Pauley (NRL)	1/14/2015	140709-0163 (ticket closed)	44.07301399 -103.2102729 1030.555 m 1028.948 m (11/12/2015)
		X	44.0667	-103.2	1030	--	1/26/2015 (4/27/2015)	The same lat/lon are used in BUFR for the surface station as for the upper air station. The surface station should be at the airport; Don Rinker's ASOS list uses 44.0453, -103.0569, 965.6 m. The WMO entry also needs updating, since it is just a low-precision version of the upper air location. (4/29/15: PMP verified that BUFR uses 44.6667, -103.2, 966 m.) 1/14/16--PMP: The WMO metadata are unchanged from July.)	High	FNMOC/NRL	Dr. Pat Pauley (NRL)	2/10/2015	140709-0163 (ticket closed)	

on-U.S.

2015-2.2 Develop an OPC-collaborative observational data quality control process (to include data error tracking spreadsheet):

- Metadata error discovery, reporting, tracking, and correction (U.S. and Non-U.S.)
- Other data related issues – data access, receipt, loss, bulletin drop-outs
- Identify and list key NOAA, U.S. (other than NOAA) and WMO points of contact
- Identify OPRs to fix data issues – both U.S. and Global
- Data program managers (e.g. upper air) to pinpoint problems and find solutions

OPR: FNMOC/NRL , NAVO, AF 557th, NWS/NCEP/NCO, NWS/Office of Observations

2015-2.3 Develop a Conventional Data Technical Reference (similar to TR-1) that provides guidance in all aspects of conventional data management (e.g. acquisition, quality control, exchange)

- Include key agency and WMO POC's and focal points
- Include key references

OPR: FNMOC/NRL , NAVO, AF 557th, NWS/NCEP/NCO, NWS/Office of Observations, NWS/Office of International Affairs

2015-2.6 Track to implementation, High resolution BUFR radiosonde (RRS) data made available in real time on the GTS for U.S. stations.

- NWS project ongoing to transfer High Resolution native BUFR files from WFOs directly to NCEP/NCO for dissemination to all OPCs
- System testing of updated RRS software underway at Sterling VA (testbed)
- Testing of data dissemination and accuracy to NOAA, AF, and Navy OPCs – 5 Jul and 22 Sep – 19 Oct
- OT&E – Oct to Dec 2016
- Upgraded software deployment to WFOs - Oct 2016 to Aug 2017
- Project doesn't include U.S. military (block 70,72,74) radiosonde sites, since those sites don't have RRS installed
- The Navy no longer has a shipboard radiosonde program
- Determine feasibility of a lead agency center for oversight of military upper air stations

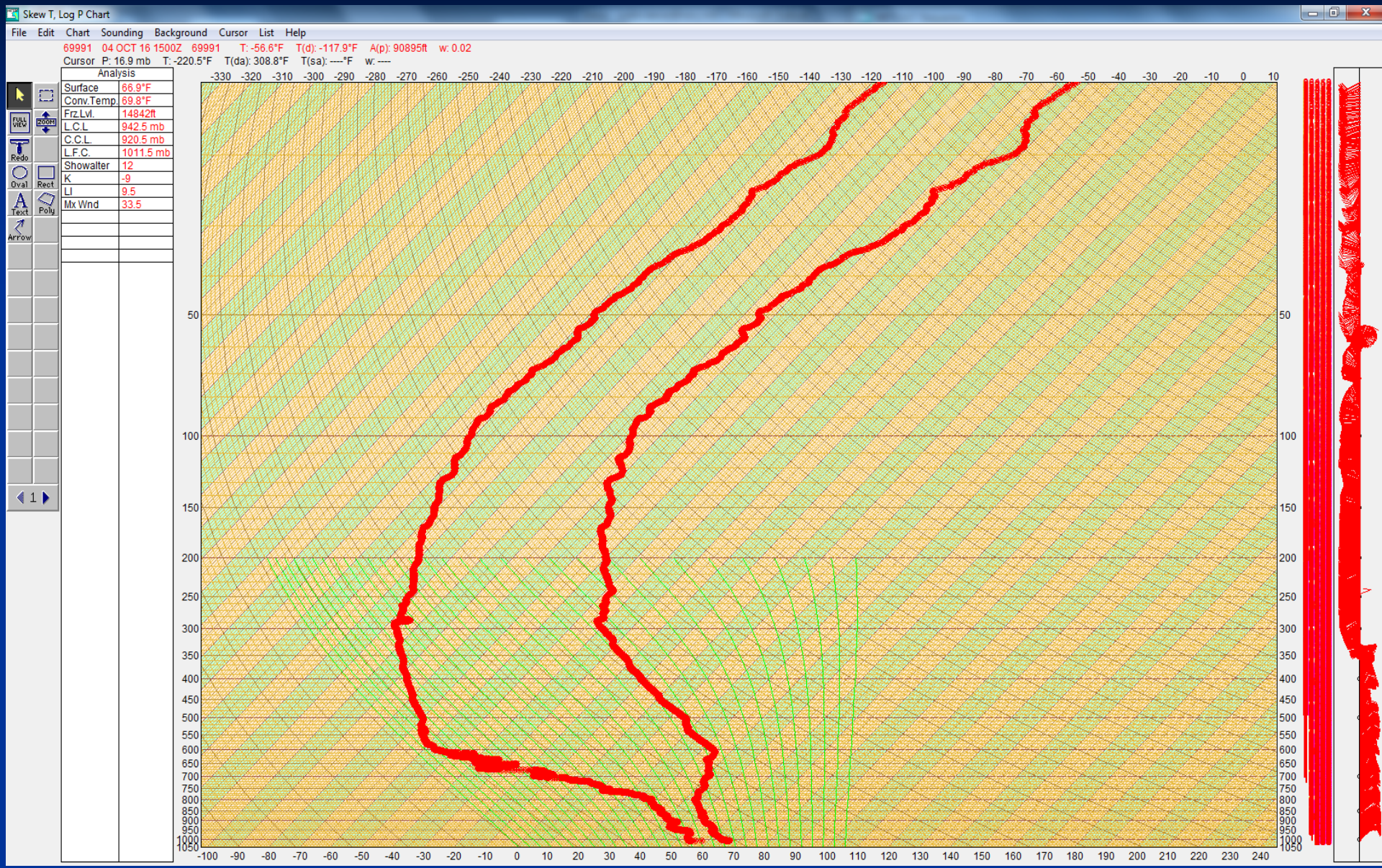
OPR: NCEP/NCO-SS and NWS/Office of Observations

2015-2.6 (continued)

- Initial test in July identified some issues, which were resolved before testing resumed in late September
- Some communication issues in September prevented delivery of high-resolution BUFR data to AF, Navy, and sometimes NCEP
- Eventually, received high-resolution BUFR, TAC and low-resolution BUFR (converted from TAC) at all participating OPCs
  - NCEP requested termination of low-res BUFR conversion from TAC
  - Both FNMOC and 557 WW needed updates to BUFR decoders due to use of a new BUFR template
  - FNMOC and NCEP verified complete decode of high-resolution BUFR (see next slide for FNMOC visualization using existing JMV application)

OPR: NCEP/NCO and NWS/Office of Observations

2015-2.6 (continued) – FNMOC JMV visualization



Next Immediate Steps

- Continue efforts to resolve critical metadata errors in collaboration with NCEP/NCO and WMO
- Continue interagency collaborative OT&E for high-res radiosonde implementation.
- Continue to foster collaborative data management relationships with NCEP/NCO and NWS/Offices of /Observations, /Dissemination, and /International Affairs

Thank you -- questions?