WSR-88D Data Status and Plans

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Family Of Services/Partners Meeting

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Outline

- Recent Major WSR-88D Milestones
  - Build 14 Impacts
- WSR-88D Program Plans
  - Builds 15-17 Software Release Plans
  - Level II Data Collection Status and Plans
  - Level III Product Collection Status and Plans
  - Product User Support and Additional Information
- User Feedback and Q&A

Recent Major WSR-88D Milestones

- Build 14 and RPG Build 14.1 Deployed in May 2014
  - As of July 29th, 143 sites have installed Build 14
- Build 14 Content affecting users
  - Supplemental adaptive intra-volume low-level scans (SAILS)
    - Repeats the lowest elevation mid-way through the volume scan of VCP 12 and 212
    - Shortens low level scan update to <3 minutes (to <2 min with AVSET)
  - Default setting for AVSET is ON
  - Storm-based auto PRF selection
    - Minimizes range folding for operator selected or top 3 (cell-based VIL) storms
  - Manual & automatic PRF selection for SZ-2 VCPs (211, 212, 221)
    - Adjusts range where range folding causes the ground clutter returns to obscure data at the beginning of the second trip
    - Will cause volume scan duration to vary by +/- 15 seconds
  - Radial-by-radial noise estimation (RxRN)
    - Increases data coverage of weak signal data, since noise is often overestimated
    - Improves estimates of Dual Pol variables and Spectrum Width
  - Coherency-based thresholding (CBT)
    - If enabled, recovers some of the data lost from the sensitivity reduction of dual pol
  - Enable site modification of DP QPE rain rate coefficients for dry snow and ice crystals

Build 14 Impacts (Reference TINs 13-4, 13-37)

- Supplemental Adaptive Intra-volume Low-level Scans (SAILS)
  - Additional N0Q/94/R and N0U/99/V products will report a volume scan time/date from the start time/date of the added split cut
  - Reduces single-site Level 3 product central collection by 10%
  - Increases single-site Level II data central collection by 5%
  - Elevation index may be thought of as changing since it's a sequential scan number
- Manual & automatic PRF selection for SZ-2 VCPs (211, 212, 221)
  - To maintain 64 pulses/radial on SZ-2 cuts, VCP time will vary by +/- 15 seconds
- Radial-by-radial noise estimation (RxRN)
  - Horizontal and vertical channel dBZ0 values to be added to the Radial Data Block within Message Type 31 and result in a Major Version change from 1 to 2
  - RxRN state (enabled/disabled) reported in the Volume Data Block within Message 31 (see "Signal Processing States", which were formerly spare bytes)
- Coherency-based Thresholding (CBT)
  - CBT state (enabled/disabled) also reported in Message 31 "Signal Processing States"
- Expansion of General Status Message and Added Information
  - Increased length to 200 bytes (was 104 bytes) and added status and spares
  - Halfword 58 will report VCP Supplemental Data (AVSET, SAILS, Site Specific VCP)

WSR-88D Software Release Plans

- Build 15 Software
  - Beta test and deployment start September and November 2014
    - RDA hardware installed with the software might stretch deployment
  - Content affecting users (limited to accommodate hardware refresh)
    - Tune RPG Initial PhiDP estimate and optionally use in RPG algorithms
    - Enable site modification of R(Z,Zdr) QPE rain rate coefficients to address tropical vs. continental drop size distributions
    - SAILS scan will be added to GSM to relate Elevation Index to angle sequence
- Build 16 Software
  - Beta test and deployment start January and April of 2015
    - RPG hardware installs might stretch deployment
  - Content affecting users
    - SAILS support and central collection of dual pol elevation products
      - DZD/159, DCC/161, DKD/163, DHC/165, ML/166 (RPCCDS issue dependency)
    - Add CBT and RxRN status to General Status Message
      - If enabled, bits 11 (CBT) and 12 (RxRN) in “VCP Supplemental Data” will be set

WSR-88D Software Release Plans

- Build 16 Software (cont.)
  - Content (cont.)
    - Improved 2D velocity dealiasing (PRF sectors, 1 m/s mode, tuning)
    - Tune RPG Dual Pol algorithms to address performance issues
    - Extend SAILS to provide up to 4 low-elevation scans per volume
      - Not operational. Possible field test depending on outcome of internal testing and capacity of central collection infrastructure

- Build 17 Software
  - Beta test and deployment start February and June of 2016
    - RDA hardware installs (June 2016 - May 2017) will stretch deployment
  - Content affecting users
    - Add large and giant hail hydrometeor categories to HCA products
      - Depends on outcome of performance testing
    - Distribute ASP product every 3 hours instead of every 8 hours
    - Add model data message to Level II data

Level II Status and Plans

- Level II network sites and content
  - Alaska sites (Version 6)
    - Kenai, Middleton Island, King Salmon, and Bethel began in September 2013
    - Sitka and Fairbanks/Nome began in February and March 2014
  - Guam (Version 6)
    - Began in February 2014
  - Version 7 sites
    - 9 DOD CONUS sites (KBBX, KFDX, KGWX, KDOX, KTYX, KHDX, KDFX, KJGX, KVNX) will transition to Version 6 by early 2015
    - Hawaii sites (TBD)
- Level II throughput (Build 14 estimate)
  - Single site throughput 50 to 480 kilo bits/second (hourly avg)
  - Network throughput 2 to 23 mega bits/second (hourly avg)
  - Throughput spread depends on weather coverage, VCP, season, and number of sites simultaneously in a VCP and/or with AVSET/SAILS enabled

Level 3 Status and Plans

- RPCCDS product latency/loss during peak summer hours
  - Observed when throughput was > 133K products/hr and > 2.5 G bytes/hour
  - TOC migrated the RPCCDS to a faster virtual server, but still having problems
  - Products are now shed when internal backlog queues reach thresholds
    - Loss of products to RPCCDS users and NCDC Archive (up to 20%)
    - Product shedding is a temporary measure to prevent excessive latencies and will be eliminated as soon as the RPCCDS problem is resolved.
  - TOC considering software rewrite – should know more later this month

Other Program Plans

- Retirement of 3 base products from NOAAport and RPCCDS moved back
  - Lowest elevation 4-bit base reflectivity (19/R, 20/R) and velocity (27/V)
  - Reference NWS TIN 09-41 (Amended), Turn Off Date for WSR-88D Low-Resolution Products Extended to 12/3/14

- TDWR – SPG
  - GSM expansion to 200 bytes (SPG Build 6.0, Deploy July 2014)
  - FAA installed new signal processor at all 45 TDWRs
    - Users may notice better data quality and increased sensitivity
    - FAA's Build 2 (~9+ months away) - improved range/velocity ambiguity mitigation
  - No SPG Level II distribution changes planned
  - NOAAport and RPCCDS distribution of VCP80 rapid scan update products
    - TIN 12-13 notified of an evaluation that started April 12, 2012 with 11 radars and TIN 13-3 notified that 7 radars were added February 27, 2013
      - 1 minute surface elevation base products
      - 3 minute storm products and 3rd elevation base products
      - Increases since single site max throughput by 2.5X to around 42 kbps
      - Adding the remaining 27 sites would increase peak throughput by 5%
    - Evaluating impacts on affected systems -- depends on resolving RPCCDS issue

WSR-88D Data and Product User Support

- Many changes in Level II Data, Level III products, Dual Pol, higher-resolution data, etc. underway:
  - Please keep checking for NWS TINs and PNSs
  - ROC web site contains TINs, PNSs, additional information
    - http://www.roc.noaa.gov/WSR88D/
- Level II and Level III products and Interface Control Documents
  - http://www.roc.noaa.gov/WSR88D/Level_III/Level3Info.aspx

Dual Pol Information

- Training
  - Initial Dual-Polarization Training for NWS Partners
    http://www.wdtb.noaa.gov/courses/dualpol/Outreach/index.html
    - Courses for meteorologists and non-meteorologists
  - Follow-on Dual Polarization Radar Training
    http://www.wdtb.noaa.gov/courses/dualpol/SOTM/index.html
    - WDTB Storm of the Month and Q&A interchange webinars were terminated
    - Sessions were “post processed” into “Dual Pol Best Practices” modules
- Additional information
  - Project information, Dual Pol sample data/products, and Interface Control Document
    - http://www.roc.noaa.gov/WSR88D/DualPol/Default.aspx

Additional Information

- Project Information: WSR-88D New Radar Technologies
  - http://www.roc.noaa.gov/WSR88D/NewRadarTechnology/NewTechDefault.aspx
- Project updates and other Level II information:
  - http://www.roc.noaa.gov/WSR88D/Level_II/Level2Info.aspx
- NWS Real-Time Level II Data Monitoring Site:
  - http://weather.noaa.gov/monitor/radar2/
- NWS Real-Time Level III Product Site Status:
  - http://weather.noaa.gov/monitor/radar/
- NWS RPCCDS Information for product users:
  - http://www.nws.noaa.gov/tg/rpccds.html
- Build specific training materials:
  - http://www.wdtb.noaa.gov/

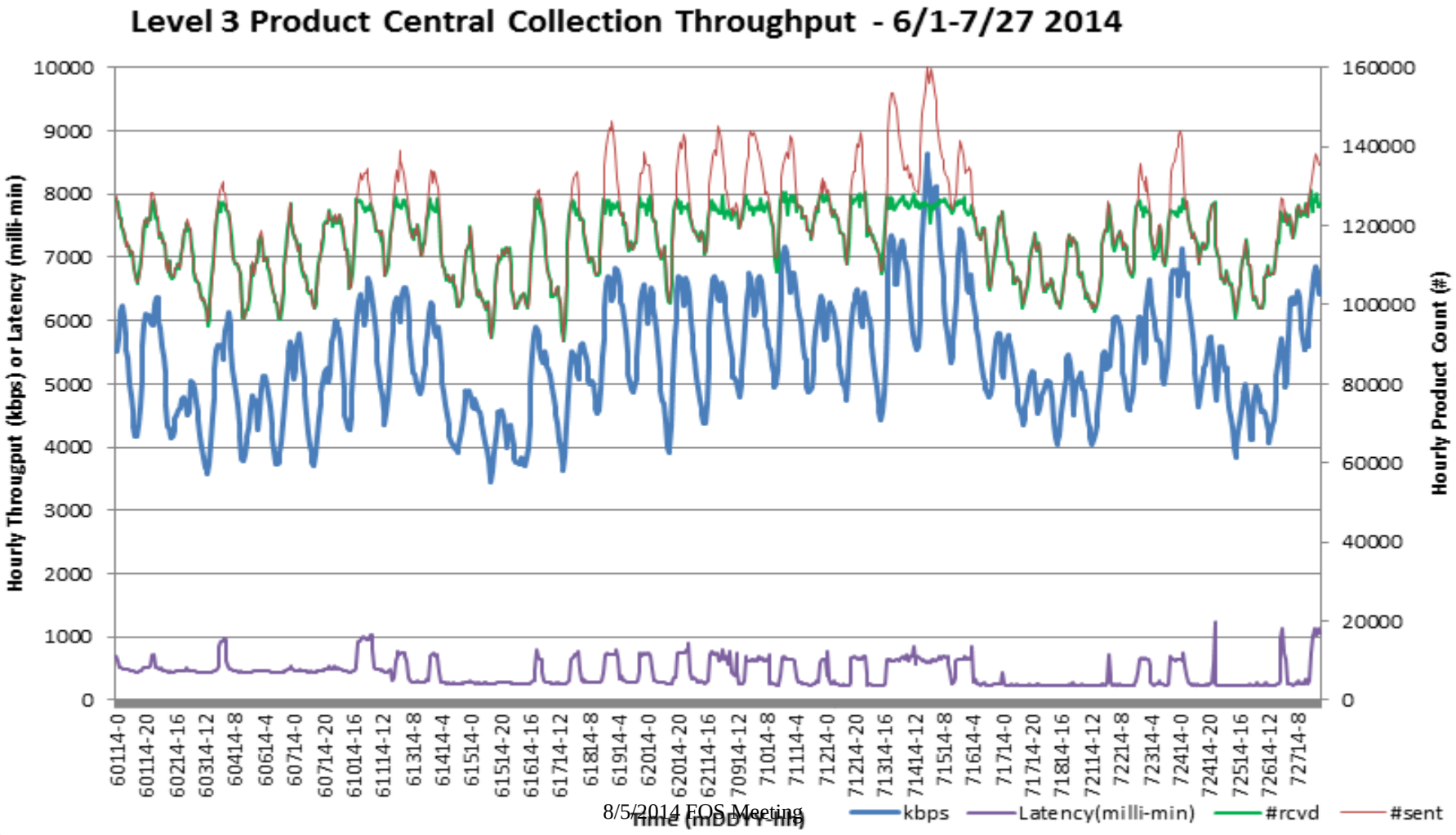
Additional Information

- NCDC Radar Resources: Order Level II and Level III Archive Data Via FTP, Use NCDC Java Viewer to View Level II and Level III Archive Data, etc.
  - http://www.ncdc.noaa.gov/oa/radar/radarresources.html
- Run RPG Software, LINUX Platform: The Common Operations and Development Environment (CODE)
  - http://www.weather.gov/CODE88D
- Federal Meteorological Handbook No. 11 (FMH-11) Part A Updated for Build 12.1 available electronically at:
  - http://www.roc.noaa.gov/WSR88D/ under “WSR-88D Program”
- Follow-up questions to: Michael.Istok@noaa.gov

Backup Slides

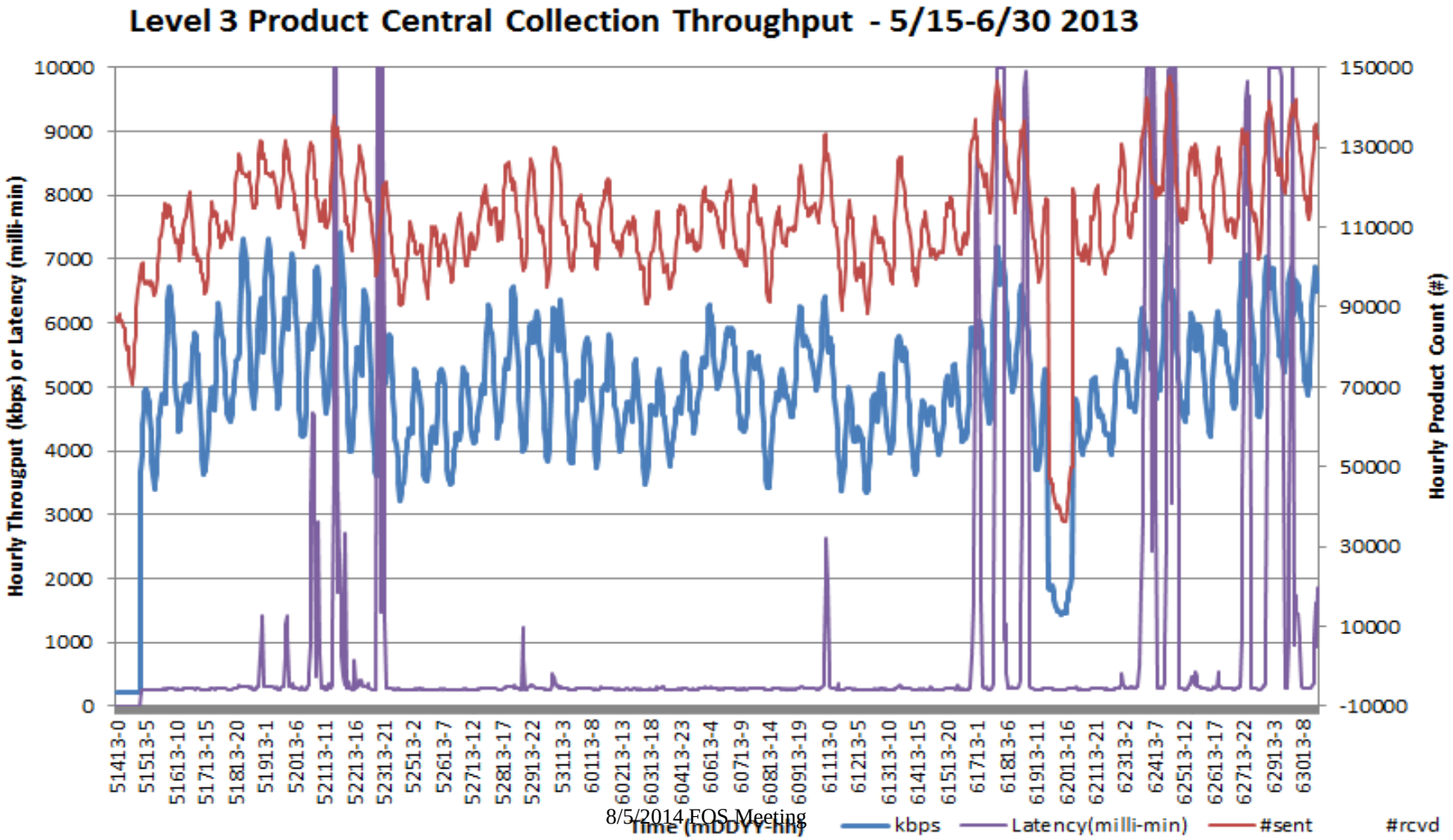
Current Level 3 Throughput

Network Total (156 WSR-88D and 45 TDWR SPG)



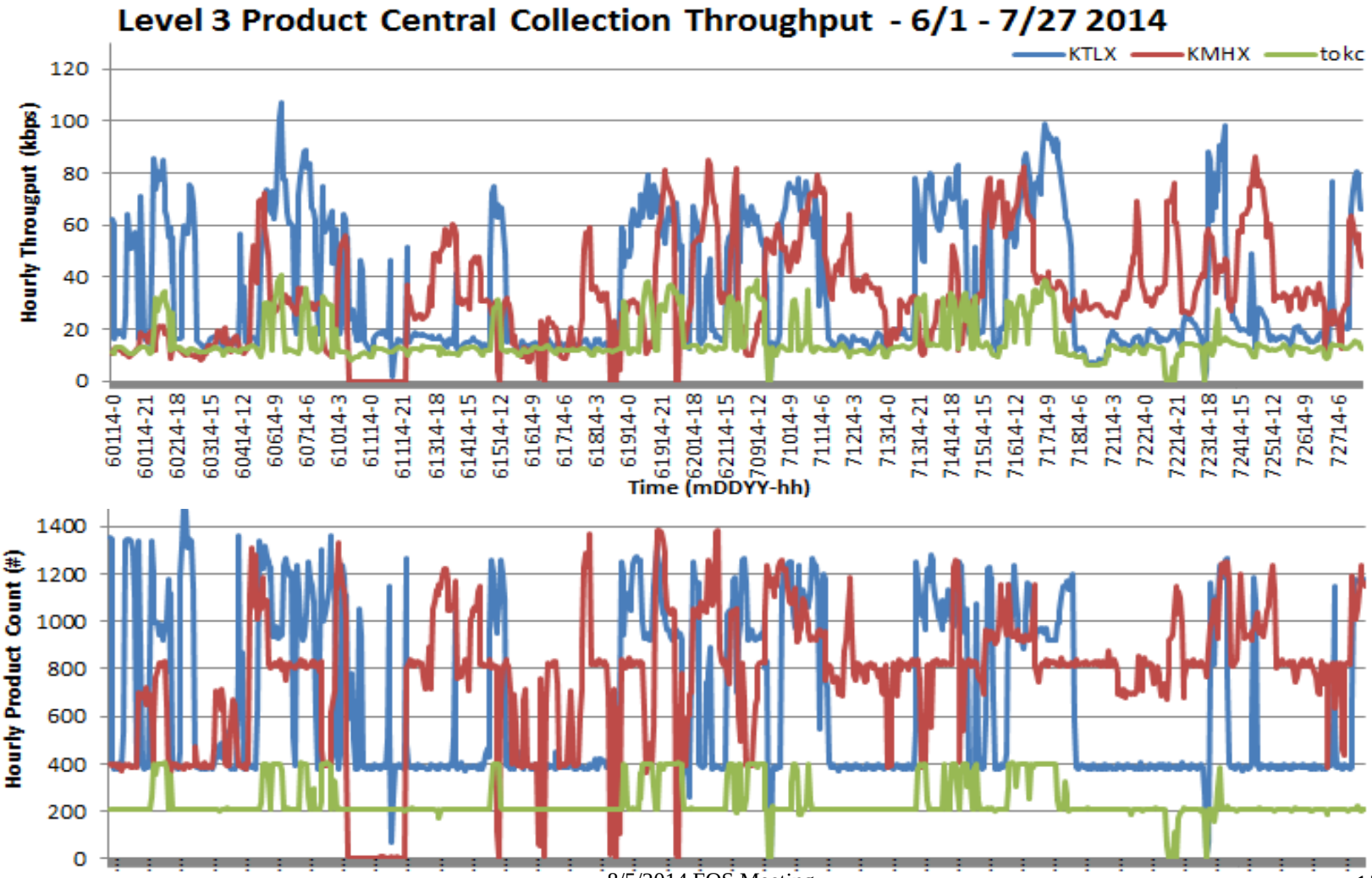
2013 Level 3 Throughput

Network Total (156 WSR-88D and 45 TDWR SPG)



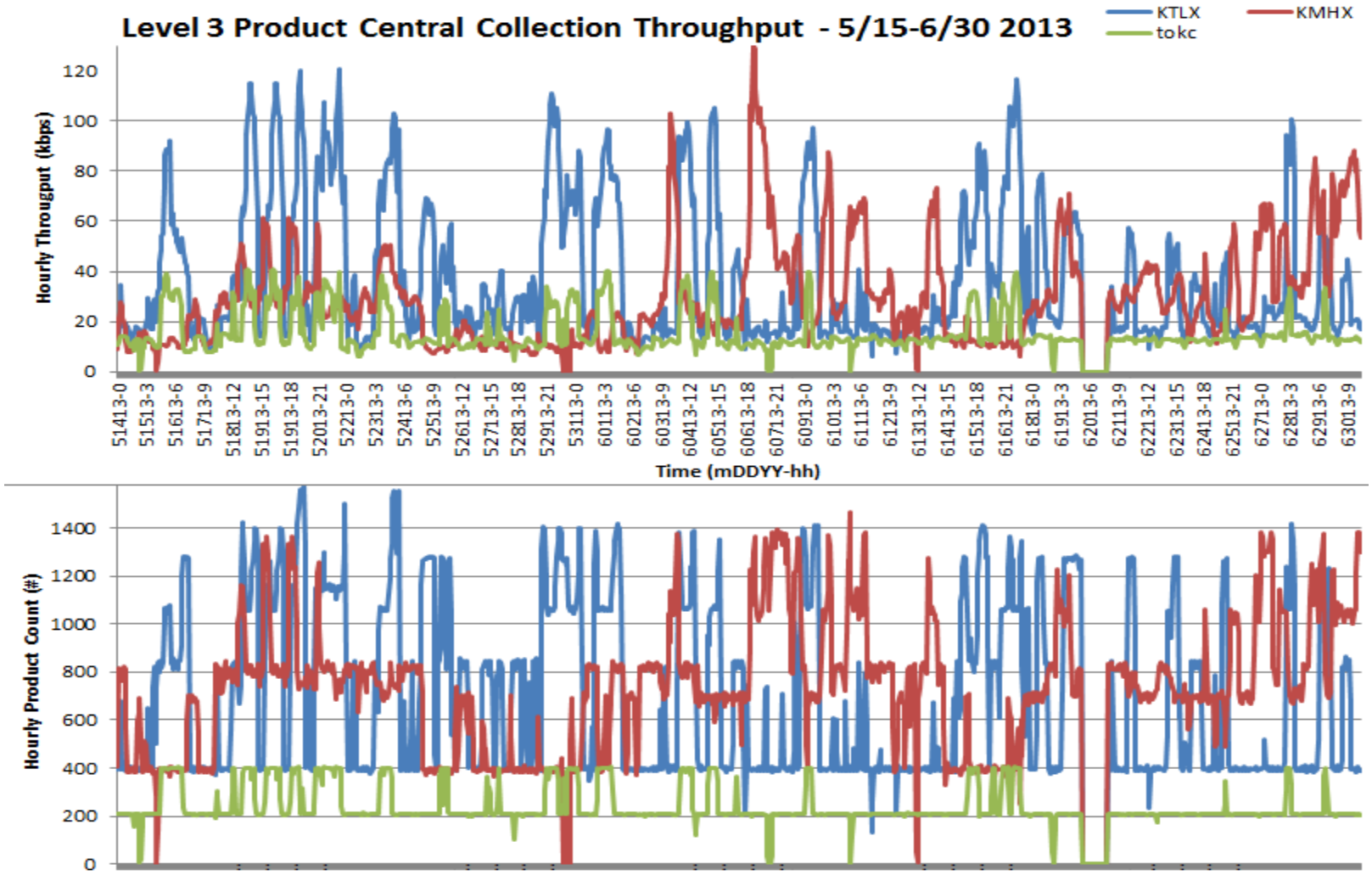
Current Level 3 Throughput

Single Site NEXRAD Dual Pol and TDWR SPG



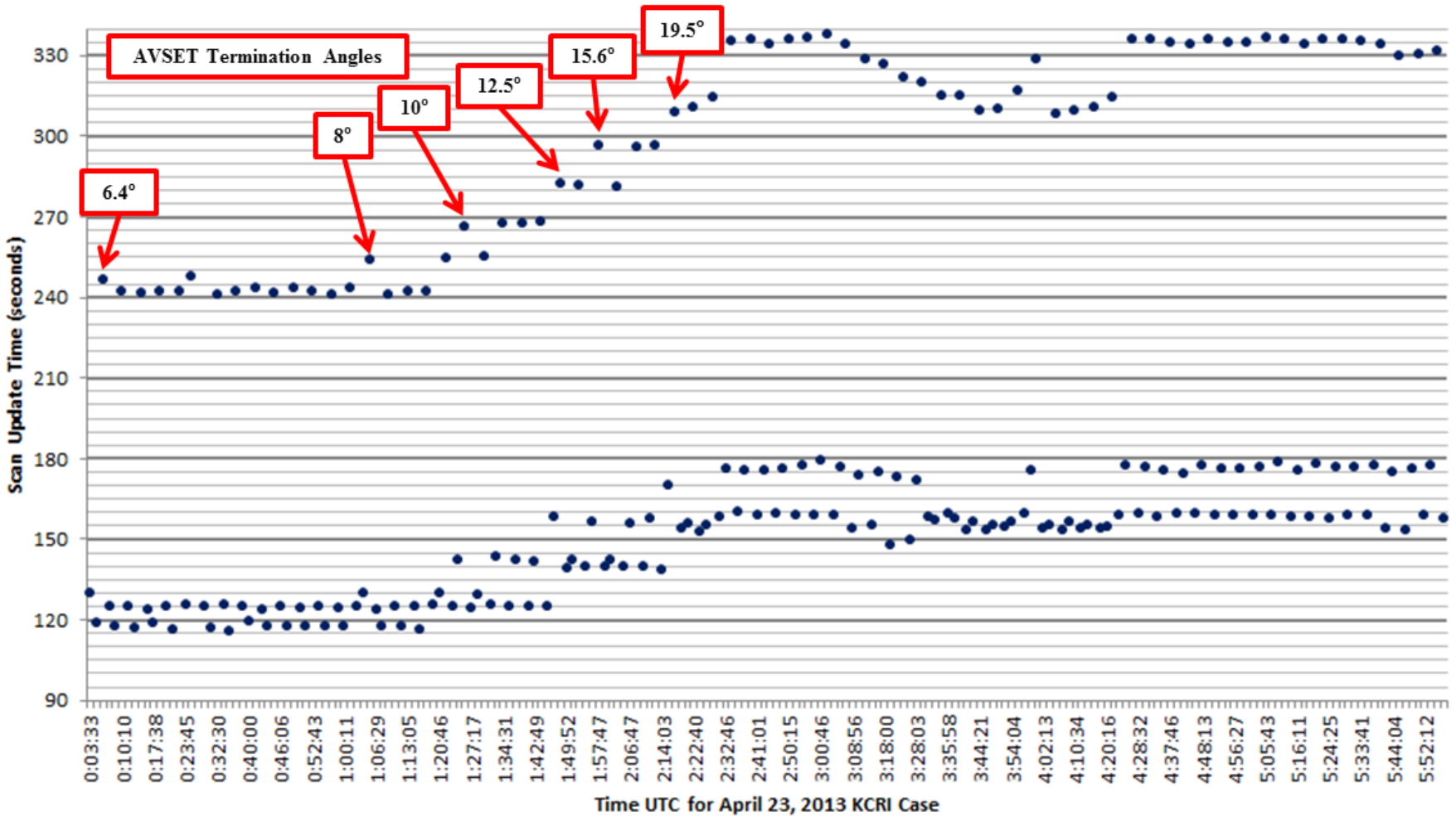
2013 Level 3 Throughput

Single Site NEXRAD Dual Pol and TDWR SPG



Elevation and Volume Scan Timing

VCP 212 with SAILS, AVSET, and Auto-PRF



Versions of Level II Data

- Starting in RPG Build 12.1, RDA will always provide
  - Reflectivity data at 250 meter range resolution
  - Velocity and Spectrum Width to 300 km max range (< 70 kft altitude)
- Version numbers indicate type of data
  - Meaning of Version 3 changed with RPG Build 12.1
- Plan for Dual Pol
  - NWS and CONUS DoD WSR-88Ds to provide version 6
  - FAA WSR-88Ds will provide version 6, but Hawaii will be version 7
  - Other Versions in special cases
- Degraded data characteristics driven by NWS comms funding availability

		RDA Super Res Control		Level II Version Number				
				Pre-Dual Pol Super-Res	Recombined and delete Dual Pol	Dual Pol w/ Super-Res Disabled	Dual Pol w/ Super-Res Enabled	Recombined Dual Pol
#	Data Characteristic	Disabled	Enabled	3	4	5	6	7
1	Azimuthal resolution on split cuts (deg)	1	0.5	0.5	1	1	0.5	1
2	Azimuthal resolution on batch and above cuts (deg)	1	1	1	1	1	1	1
3	Reflectivity range resolution on split cuts (m)	250	250	250	1000	250	250	250
4	Reflectivity range resolution of batch and above cuts (m)	250	250	1000*	1000	250	250	250
5	Reflectivity data included on Doppler split cuts	No	Yes	Yes	No	No	Yes	No
6	Doppler data to 300 km	Yes	Yes	Yes	No	Yes	Yes	Yes
9	Dual pol data included	Yes	Yes	No	No	Yes	Yes	Yes
7	Dual pol data at 250m range resolution	Yes	Yes	na	na	Yes	Yes	Yes
8	Dual pol data to 300km range	Yes	Yes	na	na	Yes	Yes	Yes
		RDA/RPG Link		LDM Level II				
	Volume Average Worst Case Throughput (kbps)	**3:1 Compression**		**4.1:1 Compression**				
	VCP 12	358	502	158	80	231	329	231
	VCP121	250	389	174	80	156	249	156
	Allocation	512	768	384	128	384	512	384

* Becomes 250 m in Build 12.1

WSR-88D Dual Pol Level III

#	PRODUCT	PRODUCT HEADERS		ELEVATION ANGLES (DEGREES)	NWSTG RPCCDS FTP Dir Name	Average Size (Kbytes) *estimate
		RPG HEADER	WMO HEADER			
1	<u>Differential Reflectivity</u> - 0.13 nmi resolution, 162 nmi max range, 256 data levels (0.0625 dB)	159/DZD	SDUS8i cccc N0X xxx	0.5	DS.159x0	58*
2		159/DZD	SDUS8i cccc NAX xxx	0.9	DS.159xa	50*
3		159/DZD	SDUS8i cccc N1X xxx	1.3, 1.5	DS.159x1	45*
4		159/DZD	SDUS8i cccc NBX xxx	1.8	DS.159xb	40*
5		159/DZD	SDUS8i cccc N2X xxx	2.4, 2.5	DS.159x2	36*
6		159/DZD	SDUS8i cccc N3X xxx	3.1, 3.4, 3.5	DS.159x3	30*
7	<u>Correlation Coefficient</u> - 0.13 nmi resolution, 162 nmi max range, 256 data levels (0.00333)	161/DCC	SDUS8i cccc N0C xxx	0.5	DS.161c0	59*
8		161/DCC	SDUS8i cccc NAC xxx	0.9	DS.161ca	55*
9		161/DCC	SDUS8i cccc N1C xxx	1.3, 1.5	DS.161c1	50*
10		161/DCC	SDUS8i cccc NBC xxx	1.8	DS.161cb	45*
11		161/DCC	SDUS8i cccc N2C xxx	2.4, 2.5	DS.161c2	37*
12		161/DCC	SDUS8i cccc N3C xxx	3.1, 3.4, 3.5	DS.161c3	33*
13	<u>Specific Differential Phase</u> - 0.13 nmi resolution, 162 nmi max range, 256 data levels (0.05 deg/km)	163/DKD	SDUS8i cccc N0K xxx	0.5	DS.163k0	7*
14		163/DKD	SDUS8i cccc NAK xxx	0.9	DS.163ka	7*
15		163/DKD	SDUS8i cccc N1K xxx	1.3, 1.5	DS.163k1	7*
16		163/DKD	SDUS8i cccc NBK xxx	1.8	DS.163kb	6*
17		163/DKD	SDUS8i cccc N2K xxx	2.4, 2.5	DS.163k2	6*
18		163/DKD	SDUS8i cccc N3K xxx	3.1, 3.4, 3.5	DS.163k3	5*

WSR-88D Dual Pol Level III

#	PRODUCT	PRODUCT HEADERS		ELEVATION ANGLES (DEGREES)	NWSTG RPCCDS FTP Dir Name	Average Size (Kbytes) *estimate
		RPG HEADER	WMO HEADER			
19	<u>Hydrometeror Classification</u> - 0.13 nmi resolution, 162 nmi max range, 8bit but only 12 categories	165/DHC	SDUS8i cccc N0H xxx	0.5	DS.165h0	14*
20		165/DHC	SDUS8i cccc NAH xxx	0.9	DS.165ha	13*
21		165/DHC	SDUS8i cccc N1H xxx	1.3, 1.5	DS.165h1	12*
22		165/DHC	SDUS8i cccc NBH xxx	1.8	DS.165hb	11*
23		165/DHC	SDUS8i cccc N2H xxx	2.4, 2.5	DS.165h2	10*
24		165/DHC	SDUS8i cccc N3H xxx	3.1, 3.4, 3.5	DS.165h3	9*
25	<u>Melting Layer</u> - 162 nmi max range, 4 levels (contours)	166/ML	SDUS8i cccc N0M xxx	0.5	DS.166m0	5*
26		166/ML	SDUS8i cccc NAM xxx	0.9	DS.166ma	5*
27		166/ML	SDUS8i cccc N1M xxx	1.3, 1.5	DS.166m1	5*
28		166/ML	SDUS8i cccc NBM xxx	1.8	DS.166mb	5*
29		166/ML	SDUS8i cccc N2M xxx	2.4, 2.5	DS.166m2	5*
30		166/ML	SDUS8i cccc N3M xxx	3.1, 3.4, 3.5	DS.166m3	5*
31	Digital Inst. Precip. Rate(in/hr)	176/DPR	SDUS8i cccc DPR xxx	Elev Angle Not Applicable	DS.176pr	15*
32	Hybrid Scan Hydrometeor Classificati	177/HHC	SDUS8i cccc HHC xxx	Elev Angle Not Applicable	DS.177hh	4*
33	One hour Accum	169/OHA	SDUS8i cccc OHA xxx	Elev Angle Not Applicable	DS.169oh	5*
34	Dig. Accum Array (unbiased)	170/DAA	SDUS8i cccc DAA xxx	Elev Angle Not Applicable	DS.170aa	15*
35	Storm Total Accum	171/STA	SDUS3i cccc PTA xxx	Elev Angle Not Applicable	DS.171st	5*
36	Dig. Storm Total Accum	172/DSA	SDUS8i cccc DTA xxx	Elev Angle Not Applicable	DS.172dt	12*
37	Dig. User-Selectable Accum:3hr/hrly	173/DUA	SDUS8i cccc DU3 xxx	Elev Angle Not Applicable	DS.173u1	12*
38	Dig. User-Selectable Accum:24hr/12Z	173/DUA	SDUS8i cccc DU6 xxx	Elev Angle Not Applicable	DS.173u3	12*
39	Dig. One Hour Difference Accum	174/DOD	SDUS8i cccc DOD xxx	Elev Angle Not Applicable	DS.174od	10*
40	Dig. Storm Total Difference Accum	175/DSD	SDUS8i cccc DSD xxx	Elev Angle Not Applicable	DS.175sd	10*