NASA SPoRT Proving Ground OCONUS Activities and the Experimental Product Development Team (EPDT)

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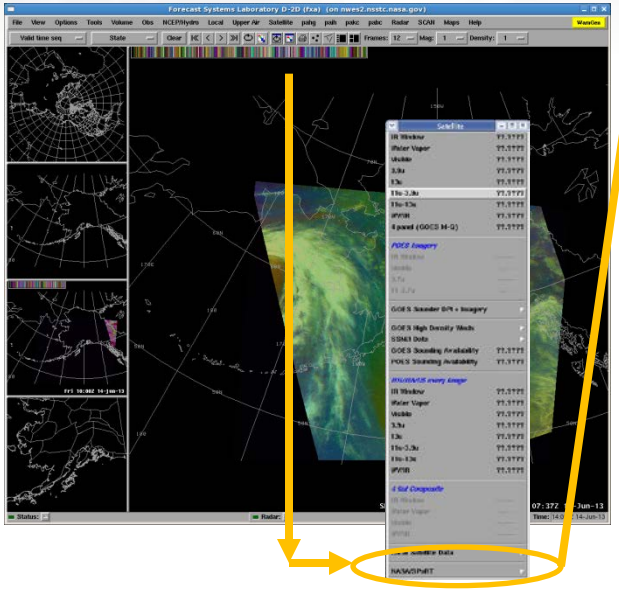
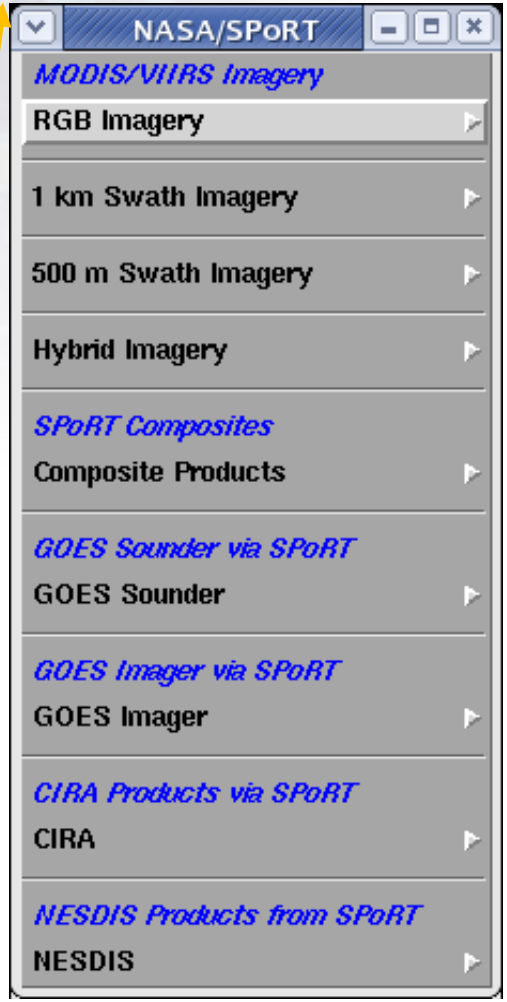
June 2013

AWIPS I Menu – NASA/SPoRT

- Suite of tailored products available for Alaska and Hawaii WFO forecast challenges
- Products complementary to those provided by CIMSS, GINA
- Forecaster time limits use beyond a few focused products

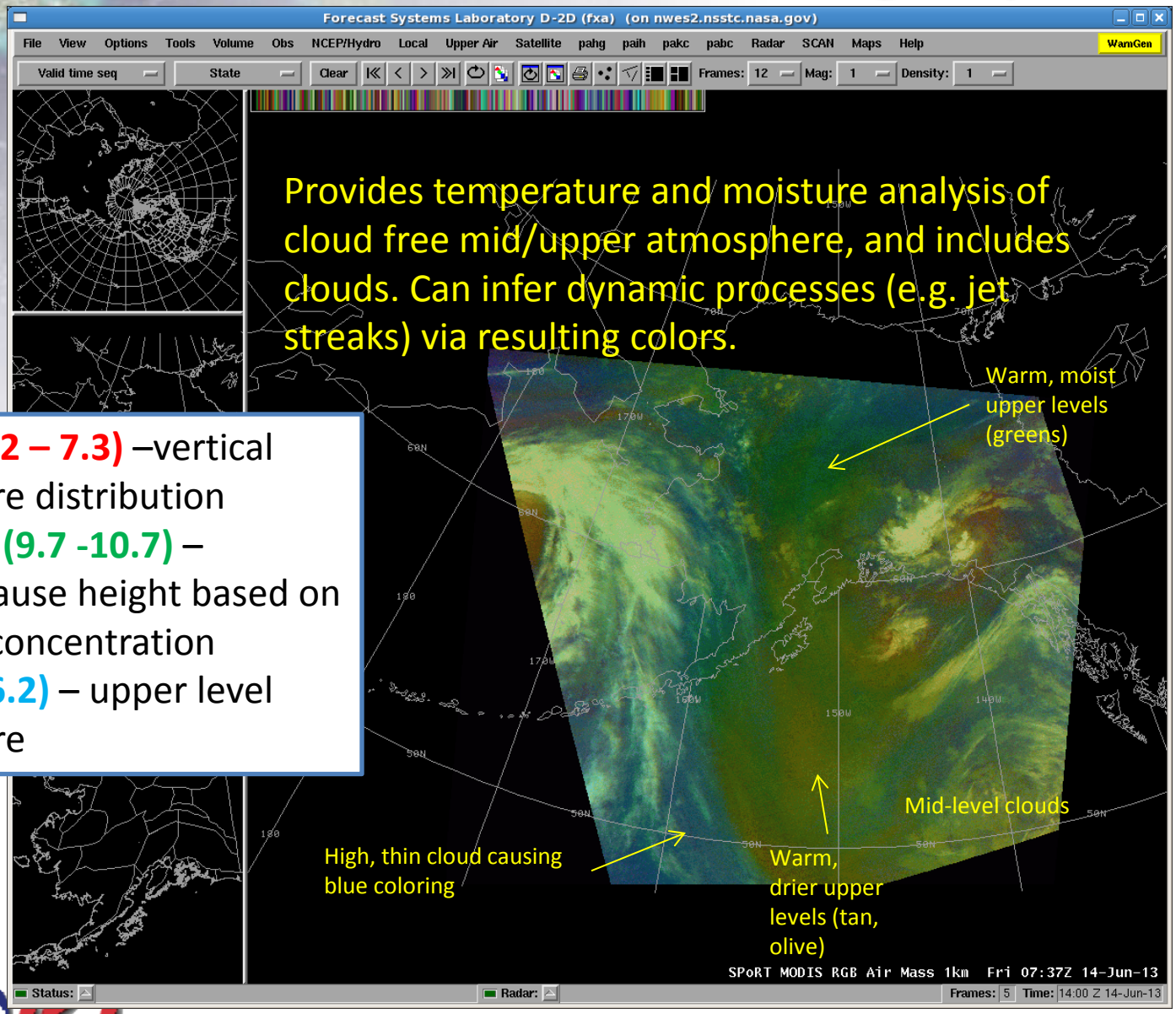




GOES-R / JPSS PG

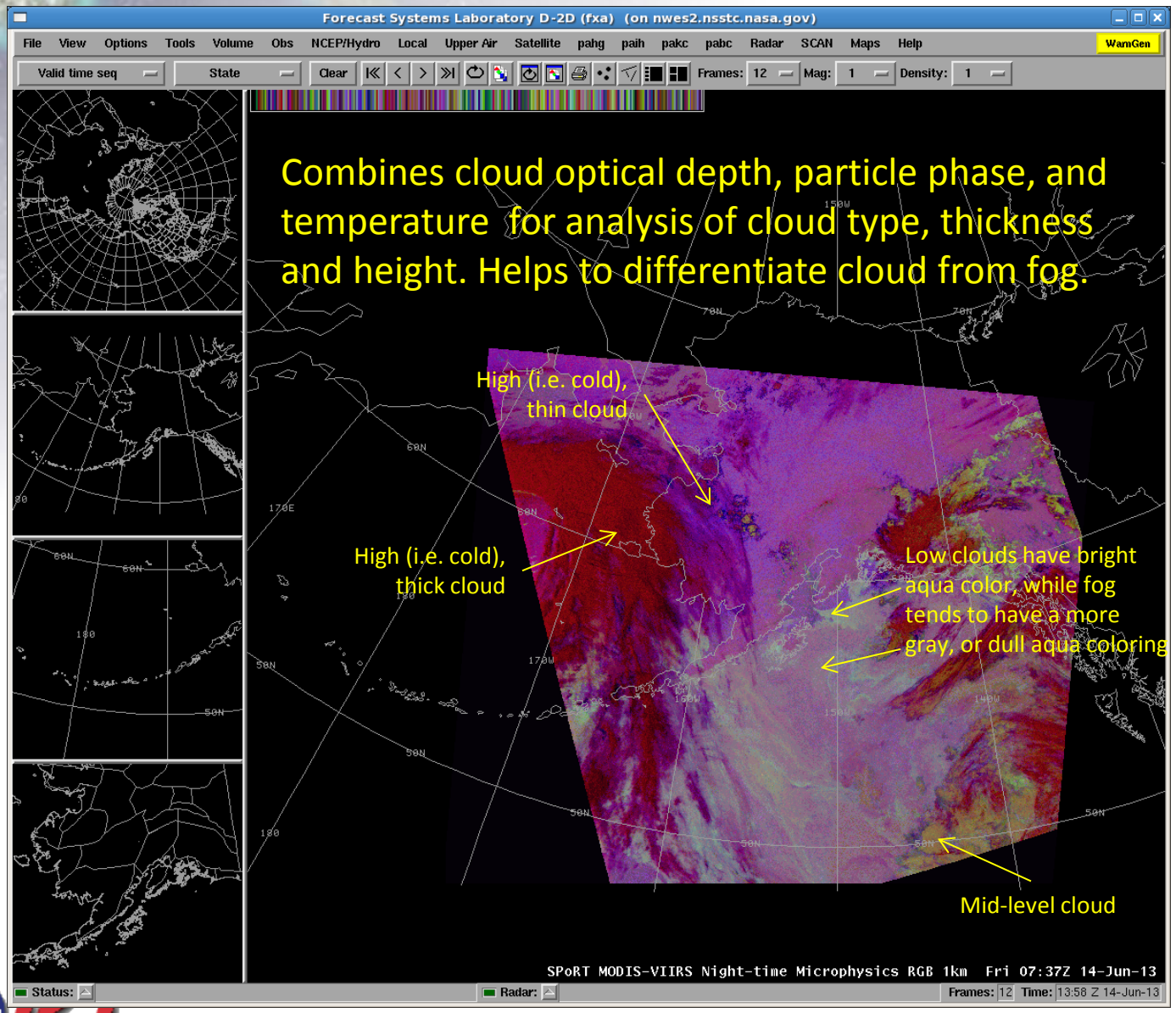
- MODIS and VIIRS swath imagery incl. DNB
- RGB products minimize use of bandwidth through channel combinations
  - air mass, dust
  - true color
  - night-time microphysics
  - day snow-cloud
  - DNB – radiance and reflectance
- POES-GOES hybrid – 3.9μm, 11μm, SWIR WV, visible
- SST composite
- CIRA TPW, LPW suite
- QPE suite

Air Mass RGB Imagery



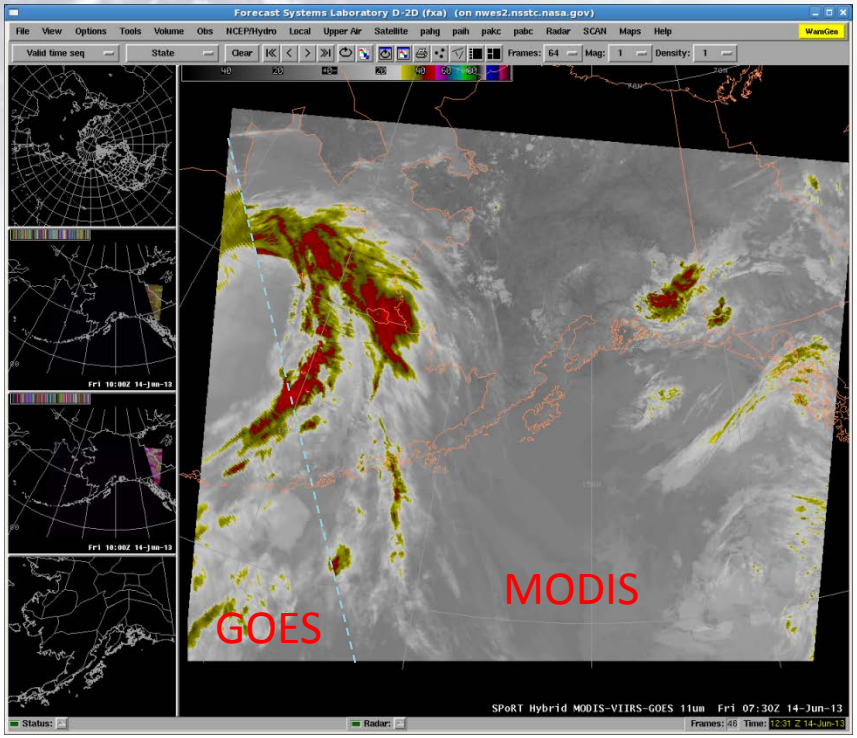
RED (6.2 – 7.3) –vertical moisture distribution
GREEN (9.7 -10.7) – tropopause height based on ozone concentration
BLUE (6.2) – upper level moisture

Night-time Microphysics RGB Imagery

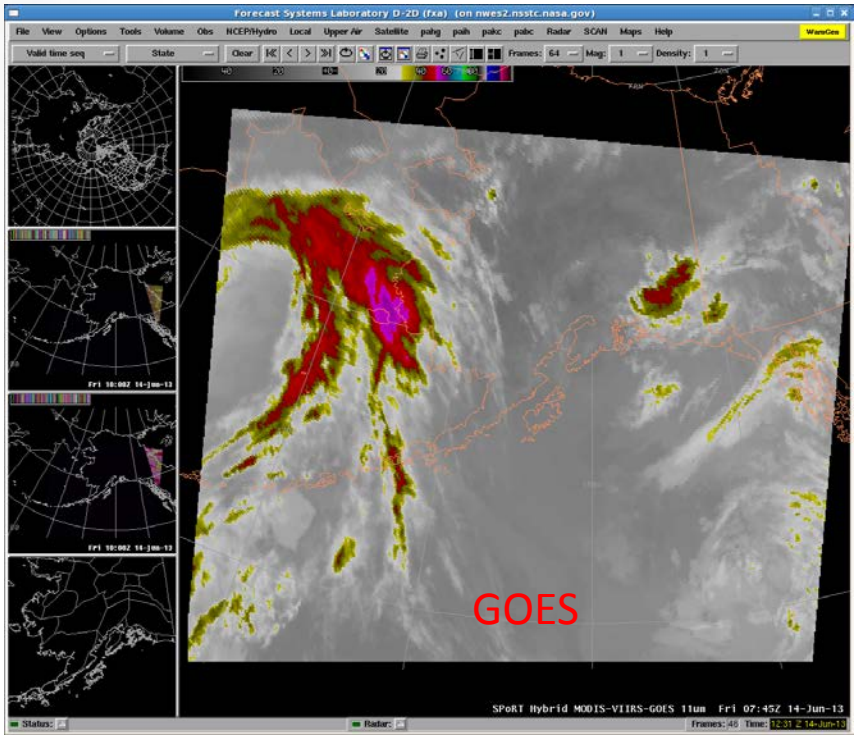


Hybrid GEO/LEO Imagery

MODIS at 0737 Z in GOES at 0730 Z



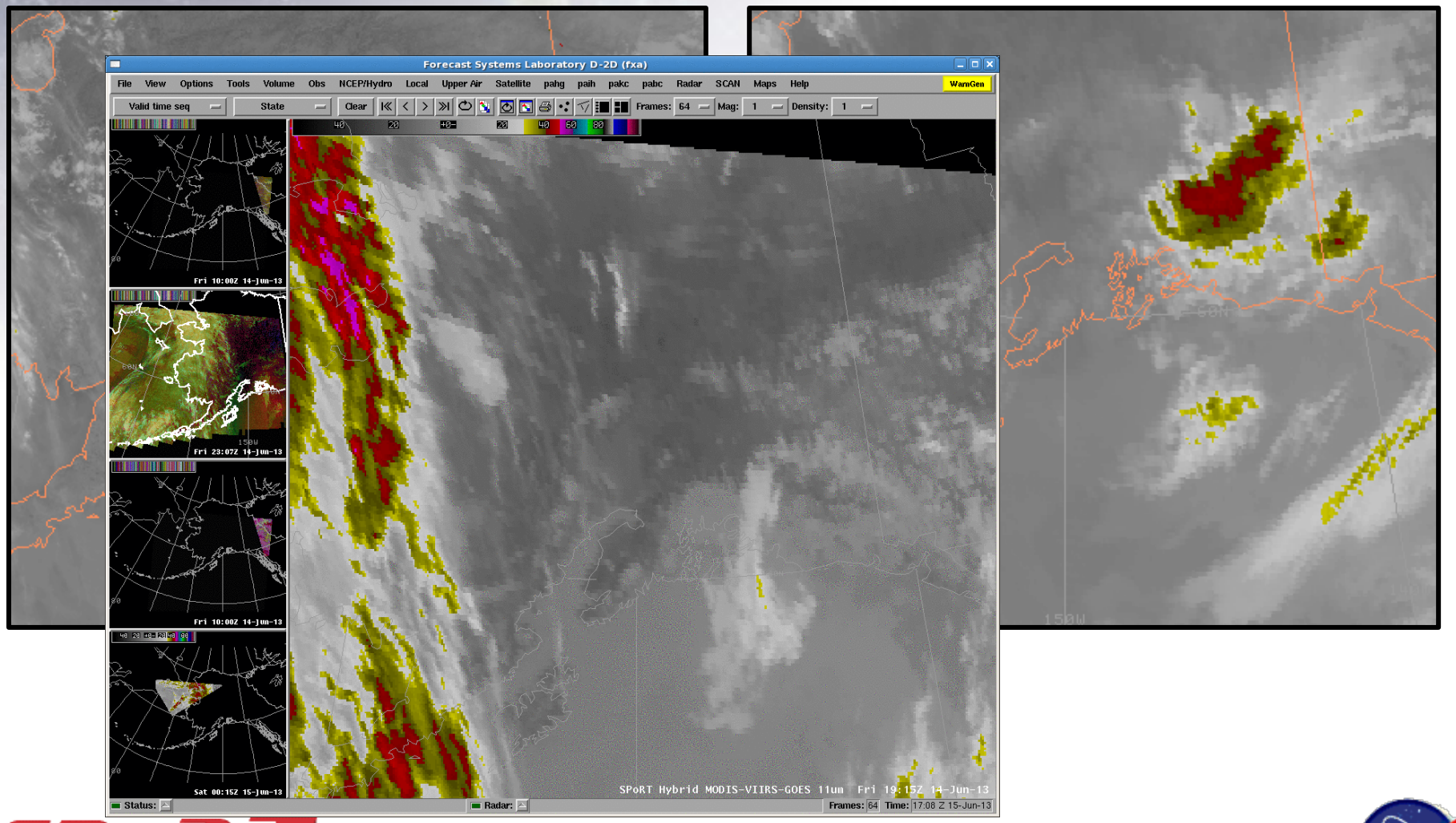
GOES only at 0745 Z



Hybrid GEO/LEO Imagery - Zoom

MODIS at 0737 Z in GOES at 0730 Z

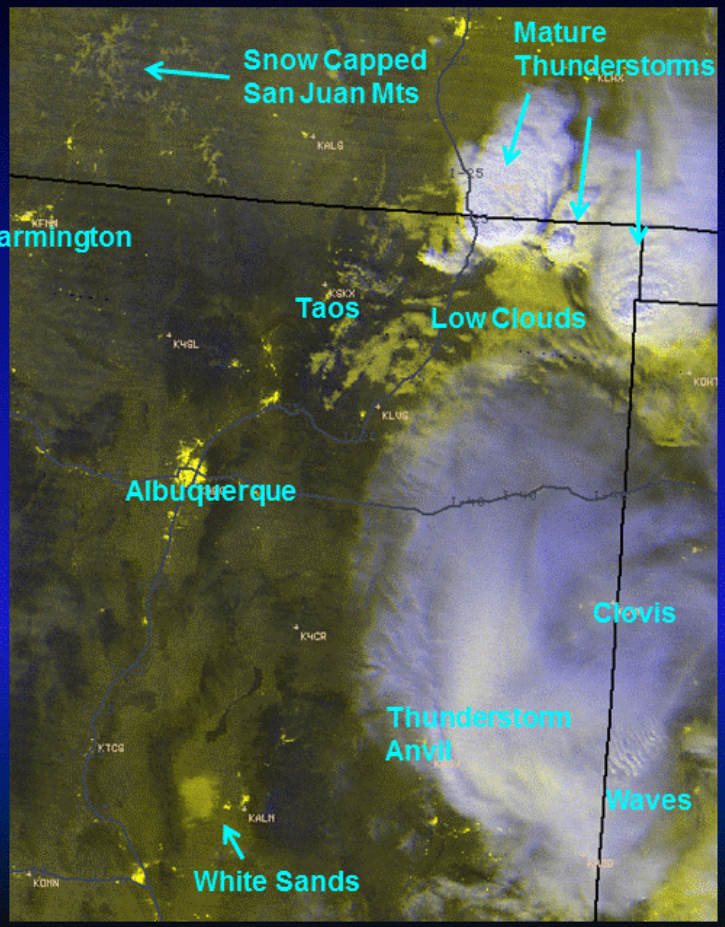
GOES only at 0745 Z



DNB RGB from ABQ Web Page

Satellite Captures Moonlit Atmosphere

NWS Albuquerque



Reflected moonlight from the full "flower" moon is providing stellar images from the VIIRS satellite.

Large thunderstorms that developed over the east last night reflected so much of the full moonlight that it was almost as if the sun was out.

Several features noted on this image include city lights, White Sands, snow capped mountains, low clouds, wave clouds, thunderstorm anvils, and mature storm updrafts.

May 25, 2013 147am

SPoRT Focus in Alaska and Hawaii

Areas of Concentration

- Quantitative Precipitation Estimate (QPE) Suite
  - Collaboration with NESDIS
- CIRA Layered Precipitable Water (LPW) – a NASA ROSES funded activity
- RGB Composite Imagery
  - MODIS and VIIRS
  - Adjustments for high-lat.
- Hybrid GEO/LEO Imagery in AWIPS
  - MODIS and VIIRS
  - 11um, 3.9um, Vis., WV/AirMass, Spec. Diff.
  - NT-microphysics

Other Potential Topics

- Passive microwave imagery and precipitation products
  - Working with NRL for access to AMSR2 imagery
- VIIRS Day-Night Band
  - Radiance
  - Reflectance
  - RGB

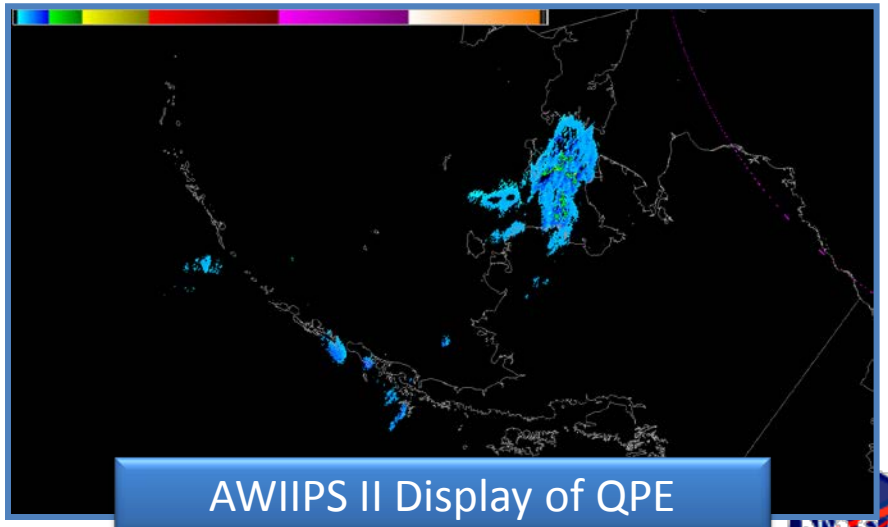
Working towards assessment QPE and LPW July 15-Sept 15

Transition of GOES-R Quantitative Precipitation Estimate

- QPE currently in Juneau & Anchorage WFOs (AWIPS I)
- Product had been in AK RFC within AWIPS I initially; to be at AK RFC within AWIPS II (see right)
- Baseline RegionalSat plugin to be used for QPE in AWIPS II
- QPE at Pacific Region
- SPoRT AWIPS I menu suite also provided to PRH (Eric Lau)
  - Eric has instructions and files for HFO
  - Bill Ward to determine products to ingest

Training

- Provided initial teletraining via AK invited PG seminar series
- PPT is available to review
- Quick Guide for OCONUS has been drafted and will be sent to users prior to start of assessment



AWIIPS II Display of QPE

Derived Multi-hour QPE Products

- In addition to the 15-minute product, multi-hour accumulation products are available:
  - 1hr
  - 3hr
  - 6hr
  - 1Day (at 12Z)
  - 3 Day (at 12Z)
  - 7 Day (at 12Z)
- Accumulation products can be used to verify/compare to model output, RFC forecasts, etc.

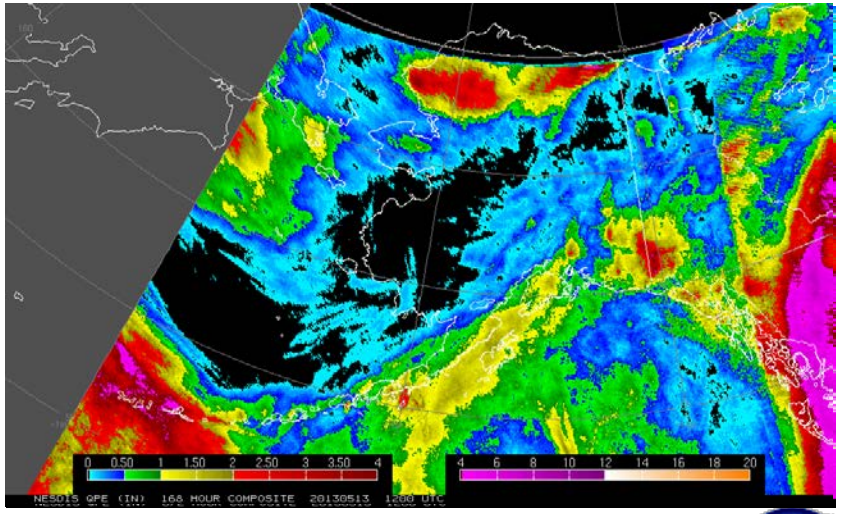
West coast WFO assessment

Off / on shore precipitation

Terrain-influenced rain, (conv/non-conv.)

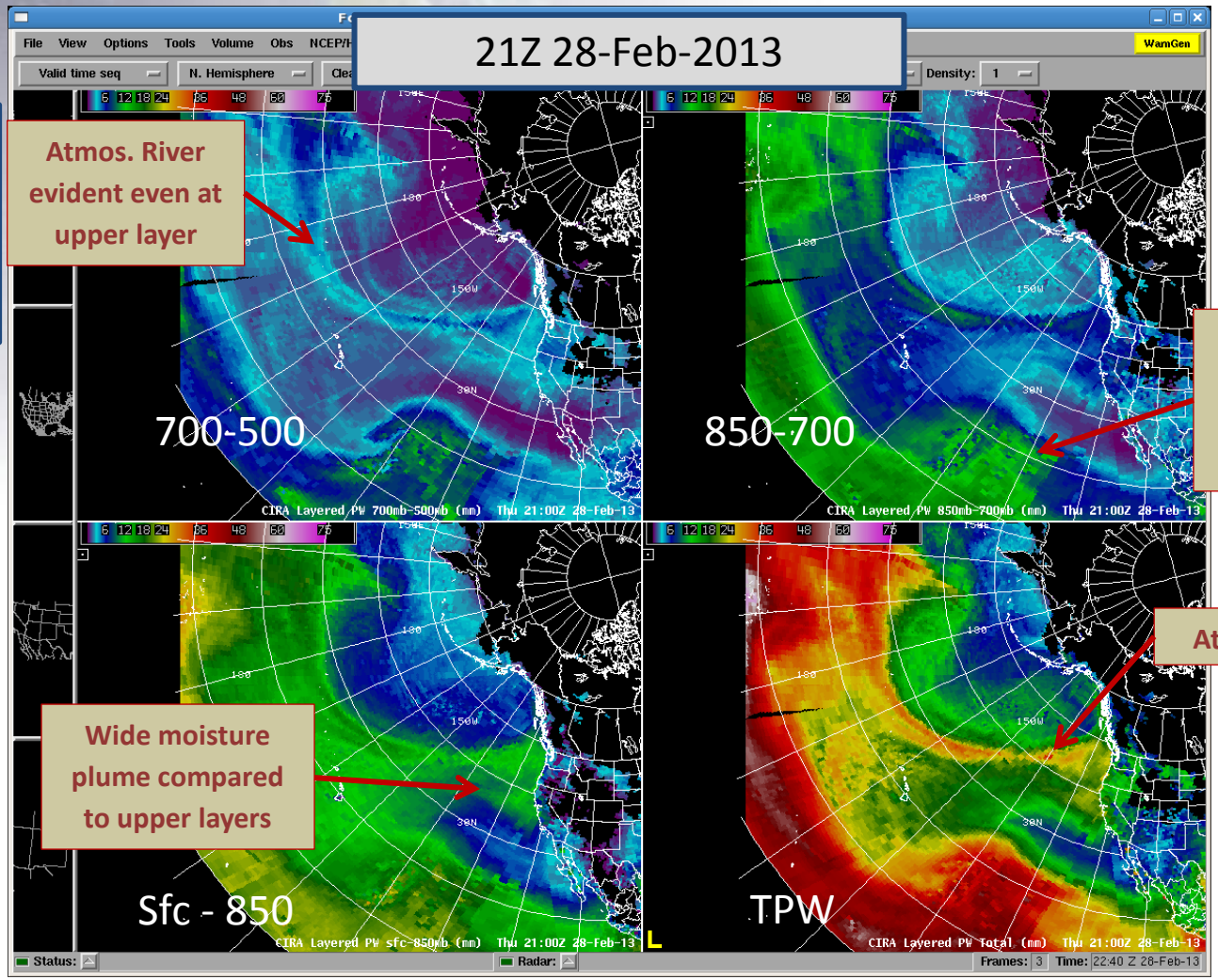
- utility for monitoring off shore wx
- flooding potential
- some inconsistencies noted
- value in accumulated rainfall totals

Examples of each QPE product over AK



CIRA Layered PW – AWIPS I

NOTE:
500-300 hPa layer not shown



Alaska Assessment of GOES-R QPE and Layered PW

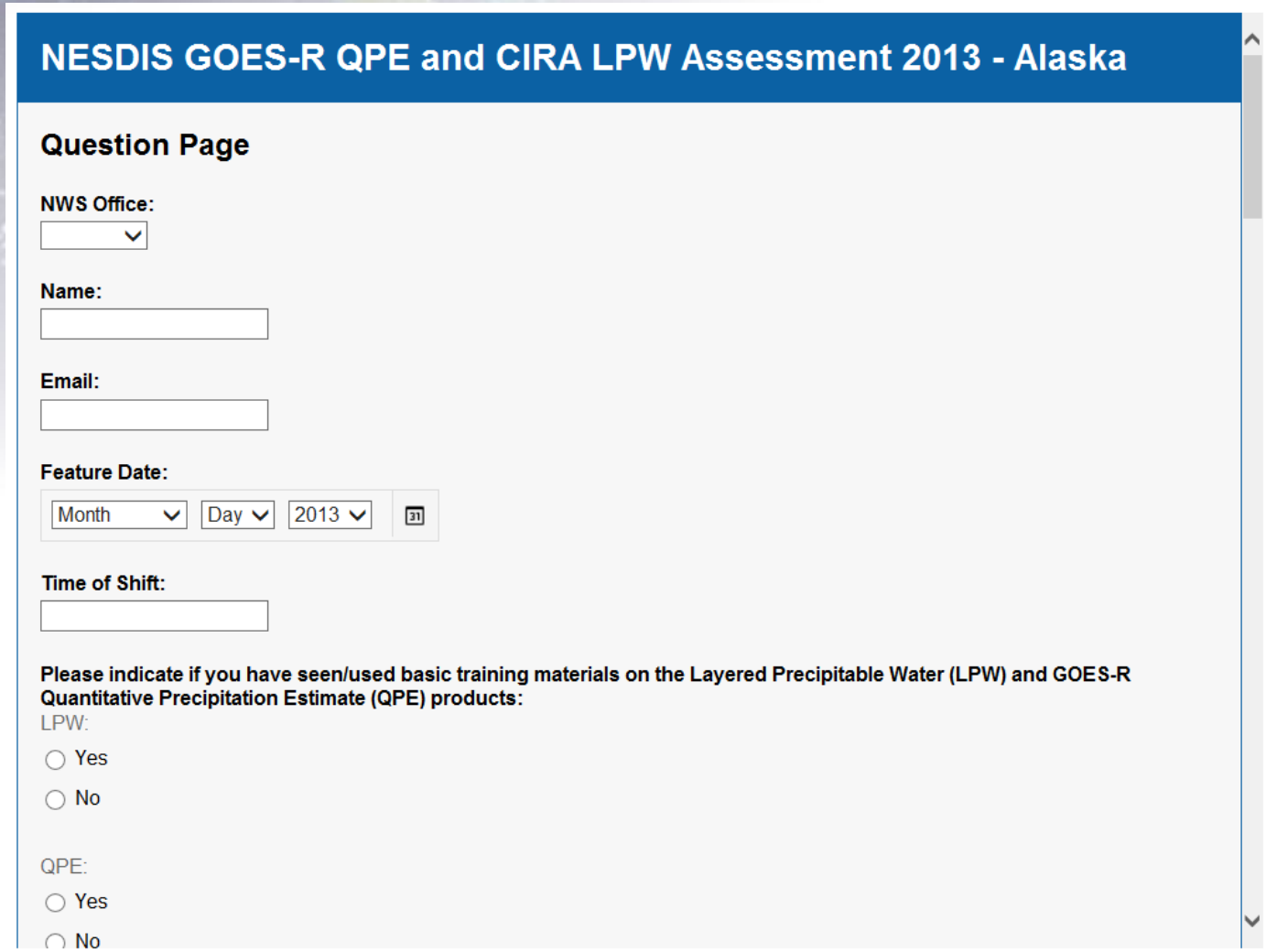
QPE / LPW value at high-latitude

- Because IR based, product does better with low latitude convective precipitation
- However, microwave data used in near real-time algorithm calibration; so want to assess high-latitude, especially where other data is lacking.
- CIRA Layered Precipitable Water also provided to compliment the QPE assessment.

Intensive Evaluation Period

- During tele-training session, users indicated that July 15 to Sept 15 is best period. Initial half captures some convective events while the end of period is when the "wet" season typically begins.
- 2-minute feedback form via SPoRT webpage
  - Via Google Docs
  - Can be linked to GOES-R PG site

Google Docs Survey Form



NESDIS GOES-R QPE and CIRA LPW Assessment 2013 - Alaska

Question Page

NWS Office:

Name:

Email:

Feature Date:

Month Day 2013

Time of Shift:

Please indicate if you have seen/used basic training materials on the Layered Precipitable Water (LPW) and GOES-R Quantitative Precipitation Estimate (QPE) products:

LPW:

- Yes
- No

QPE:

- Yes
- No

Experimental Products Development Team (EPDT) for GOES-R

So you are probably wondering:

What is the EPDT?

What does the EPDT do?

Who is on the EPDT?

What happened at the first EPDT Workshop?

What's next for the EPDT?

What is EPDT?

A community of technical experts (outside of Raytheon's AWIPS II development team) which focuses on the development, demonstration, and transition of new plug-ins and tools to address the near-term needs of the GOES-R PG community.

- Originally an internal SPoRT working group, expanded in 2012 to support GOES-R

Purpose:

- encourage and aid in AWIPS II development through fostering a network of developers
- compiling training on the AWIPS II platform
- facilitate a collaborative development environment

Objectives:

- develop and share knowledge and expertise of the AWIPS II development environment
- generate non-standard AWIPS II plug-ins for ingest, analysis, and display of experimental data
- provide a feedback loop to NWS/OST and Raytheon on the external development process, including governance of locally developed AWIPS II plug-ins and tools

Who is on the EPDT?

Limited in size to facilitate small group learning and development activities – develop into a "train the trainer" team, *learn-by-doing*

One representative (each) from:

- *NWS Regions*
- *NOAA Cooperative Institutes (and SPoRT)*
- *MDL, GSD, Raytheon*
- *NWS SEC, GOES-R PG AWIPS II developer*

Organizational leads asked to nominate team member with appropriate qualifications

- *Team Lead: Jason Burks (NASA scientist and decision support system expert), formerly HUN WFO ITO*
- *Advisor: Ed Mandel (NWS/OST SEC Development Branch Chief)*

Bimonthly conference calls/ WebEx sessions

Biannual workshops at SPoRT Visualization and Collaboration Lab

Current EPDT Members

Aaron Anderson*	NWS SR
Nancy Eustice*	NWS CR
Vasil Koleci*	NWS ER
Matt Foster*	NWS CRHQ
Craig Searcy*	NWS AR
Eric Lau	NWS PR
David Pan*	NWS SEC
Joe Zajic *	GOES-R

Deb Molenar*	CIRA
Chip Gobs*	NWS OH
Bryan Schuknecht*	NWS WR
Ken Sperow*	NWS MDL
Jordan Gerth*	CIMSS
Ed Mandel*	NWS SEC
Jim Ramer*	NOAA GSD
Nate Smith*	NWS HUN
Jason Burks*	SPoRT
Matt Smith*	SPoRT
Kevin McGrath*	SPoRT

*attended Spring 2013 Workshop

First EPDT Workshop- Spring 2013

What happened at the EPDT Workshop?

Presenters

- Jason Burks (NASA/SPoRT) — EDEX & Data plug-ins
- Max Schenkelberg (Raytheon) — Viz plug-ins
- Ed Mandel (NWS OST/SEC) — Software Governance
- Ken Sperow (MDL) — VLab
- Matt Foster (NWS/CRHQ) — GRIB ingest

Presentations recorded by NASA/MSFC Video Services

Hands-On Exercises

- EDEX and Viz plug-in

Brainstorming sessions

- AWIPS II enhancements, data additions

Feedback collected at end of workshop was that it was a resounding success.

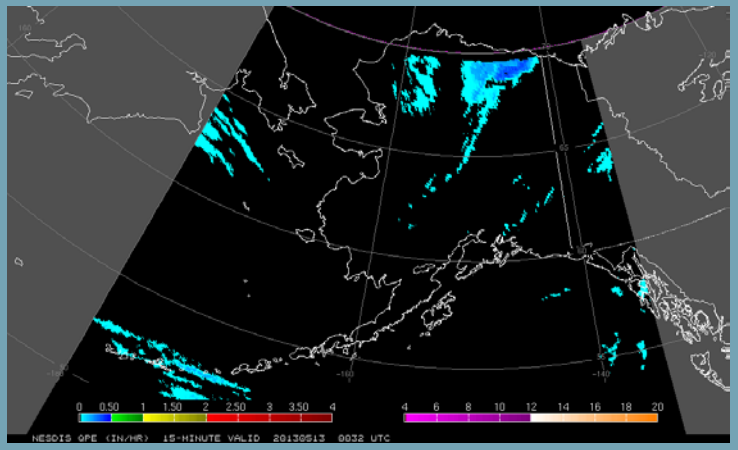
What's Next for EPDT?

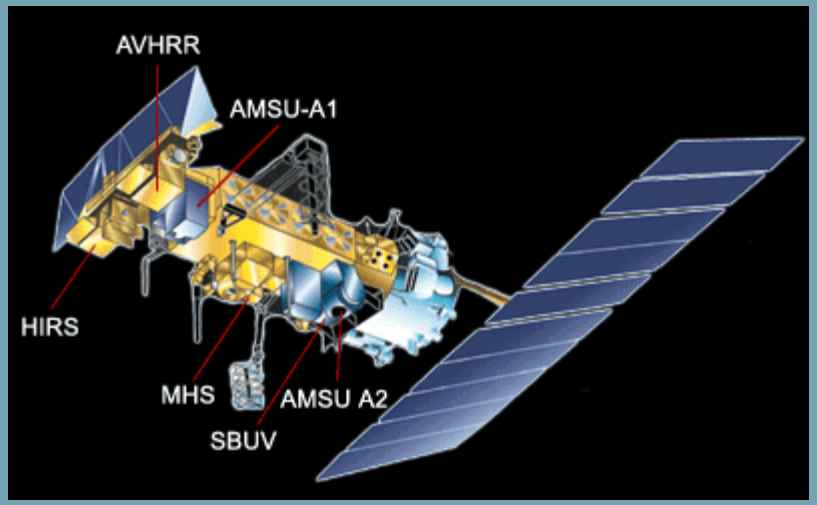
- Continuing bi-weekly conference calls on topics of interest decided by the group
- Planning for Fall 2013 Workshop – ideas being discussed on by group include
  - another instructor lead session, similar to Spring, but more advanced topics
  - Code Sprint – break into groups and work to develop plug-in during the workshop – input from GOES-R PG or NWS NOAT helpful
- Had at least other dozen ask to join team
- Considering forming another EPDTx (EPDT extended) to bring others through the process, would include:
  - workshop in Spring 2014 based on original training
  - use EPDT1 as trainers

BACKUP AND EXTRA SLIDES

QPE Product Details

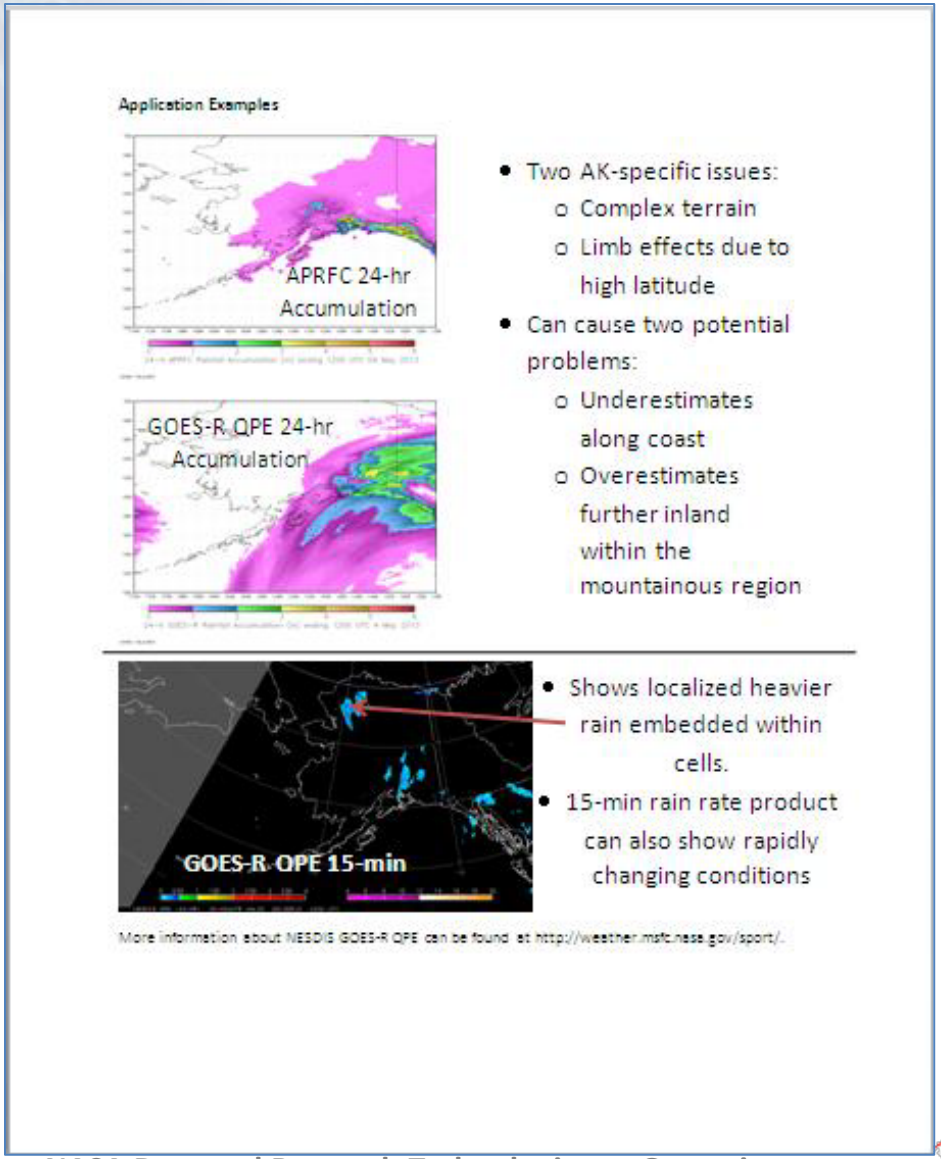
- Spatial Resolution: about 4 km on current GOES
- Temporal Resolution: 15 minutes
- Domains: all of GOES-East and GOES-West, including Alaska and Hawaii
- Input data: IR data from several GOES channels, TRMM microwave imager data, Microwave Humidity Sounder (MHS) on NOAA 18/19 and METOP-A





QPE Quick Guide for Alaska

- 2nd page of training guide on the right
- AK-centric showing examples of NESDIS GOES-R QPE
- High latitude performance expectations described in specific cases



Forecasters' Perspective of GOES-R QPE's Utility

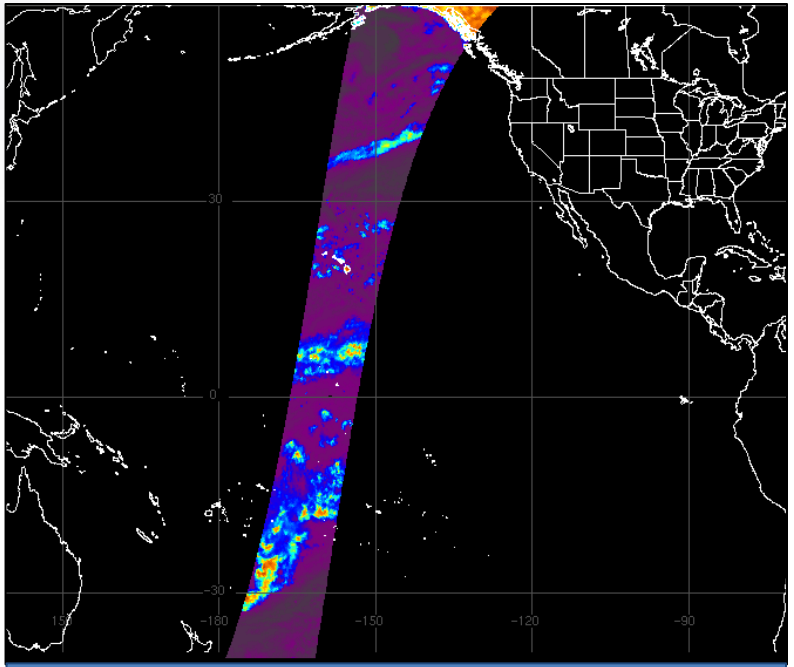
- Forecasters from 3 WFOs observed events described as terrain-influenced, convective, stratiform, frontal boundaries, and/or offshore/incoming
- Mostly day shifts
- Ideal WFO participation: MFR had 6 different forecasters evaluate the product, some who completed multiple evals
- Preferred 1-hr, 3-hr, 6-hr, and 24-hr accumulation products
- Saw potential applications for flood monitoring
  - "In theory…the usage of the QPE would be to determine a flash flood threat with the 3 or 6-hr QPE."
  - But ultimately determined that the product is not very useful in data-deprived regions because of inaccuracies

Forecasters' Perceived Accuracy of GOES-R QPE

- GOES-R QPE users in W. Coast experienced inconsistencies:
  - Underestimates along coast west of Cascades
    - "…qpe is often grossly underestimated in the coastal environment and west of the Cascsades where terrain influenced precip occurs often confined to elevations below 3-4kft without any significant IR signature"
  - Overestimates further inland as terrain became more complex.
    - "…qpe east of the Cascades often greatly overestimates due to cirrus plumes being launched off the higher terrain that aren't associated with significant precipitation"
    - Regardless of accumulation product used, event observed, etc.

CIRA Layered Precipitable Water (LPW) Composite via Microwave Integrated Retrieval System - MIRS

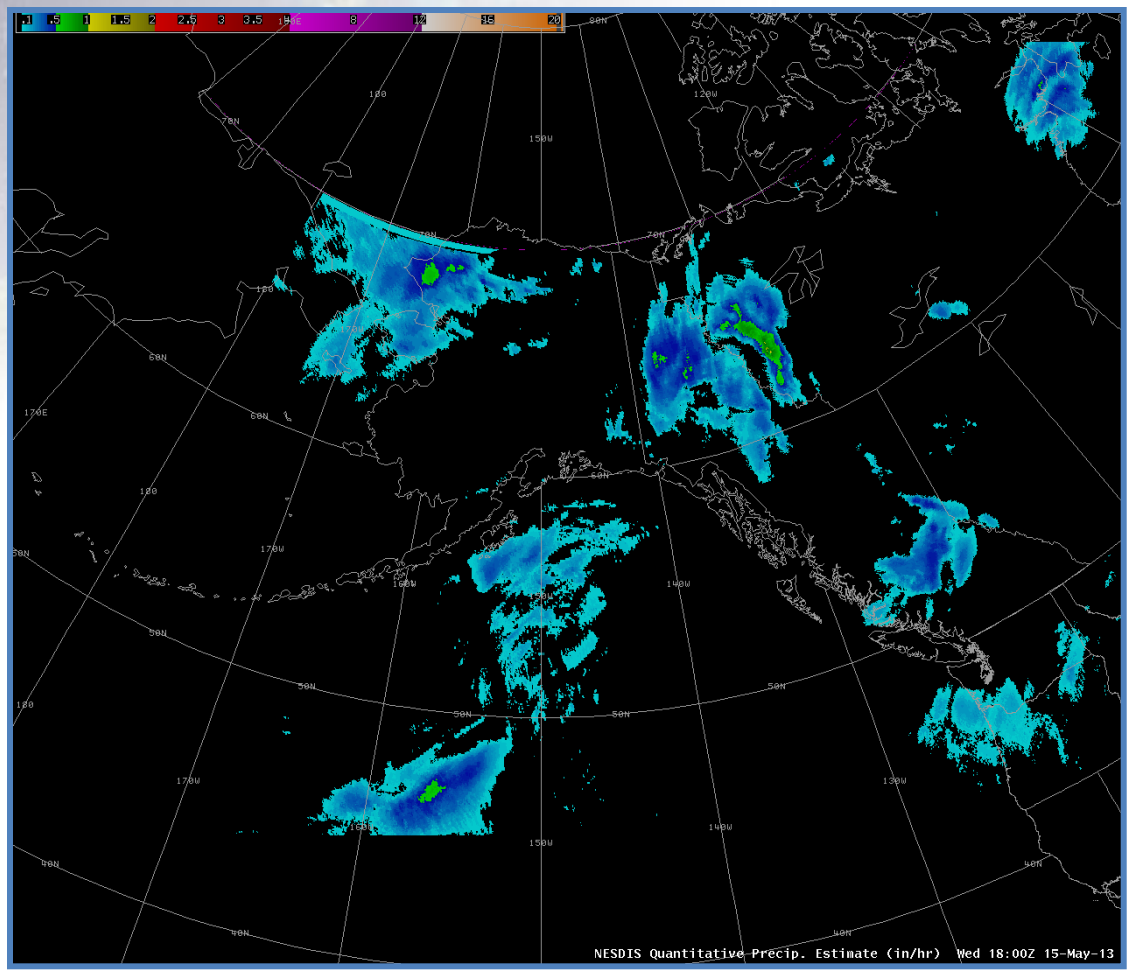
- Retrieves many variables from microwave sounding instruments (Boukabara et al. 2011)
  - AMSU-A, MHS, SSMI/S
- Uses 1DVAR (e.g., Rodgers 2000) retrieval scheme to retrieve atmospheric profile plus surface conditions.
- Retrievals through clouds
- Over water and land!
- Operationally produced by NOAA / NESDIS



37GHz (H) Brightness Temperatures from SSMI/S instrument on DMSP satellite. Just one example of the channels used by MIRS

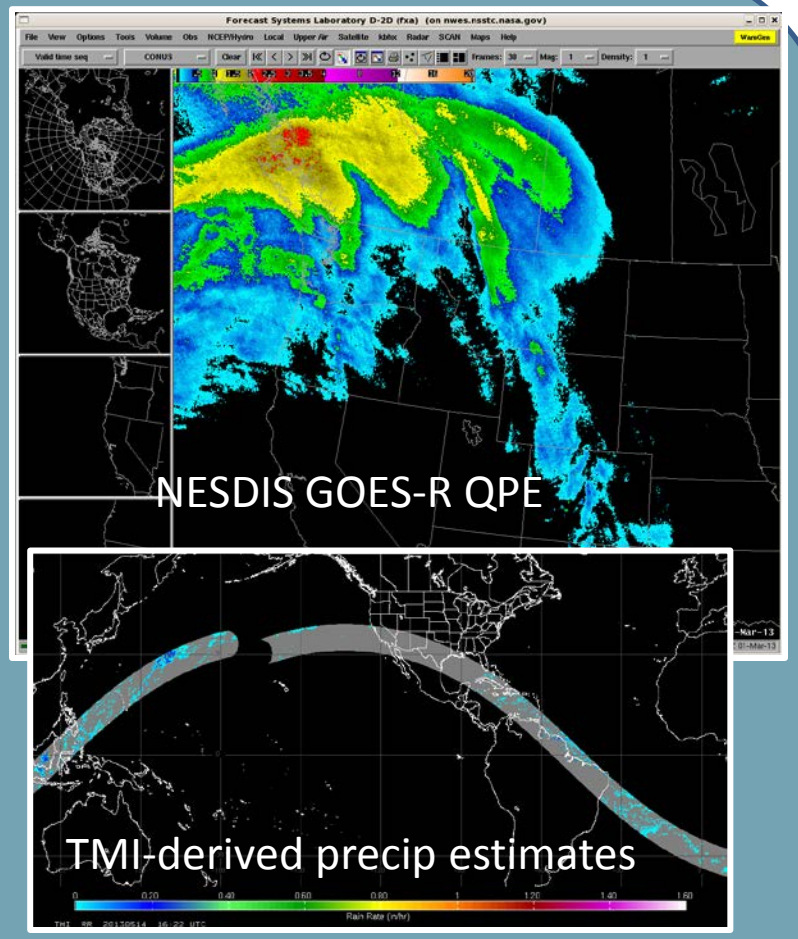
Anchorage WFO display of QPE in D-2d

Courtesy of
Jim Nelson



QPE Product and Purpose

- GOES-R Baseline product.
- The QPE product provides rainfall rate estimates (~15 min)
  - based on IR satellite data (4km)
  - calibrated against microwave rain rates (TRMM, MHS)
- QPE from GOES-R IR data will:
  - provide timely results
  - Cover a large domain (including data void regions – marine/coastal, high-lat., intermountain west)
- Near-real time, microwave input provides a more accurate calibration standard.



QPE High Latitude Example

- GOES-R QPE has been run in test mode on MSG and in real time on MTSAT, in addition to current GOES.
- Validation studies in 2005 compared MSG SEVIRI QPE algorithm to Nimrod radar data and TRMM TMI-only retrievals over Western Europe over several weeks throughout the year.
- Overall, GOES-R QPE underestimated rainfall in Europe when compared to radar (roughly by 14%).
- Caveat: Not unexpected given that the majority of rain in Europe is stratiform