



Need for IGS RT/NRT Tropospheric Products

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International GNSS Service Analysis Center Workshop

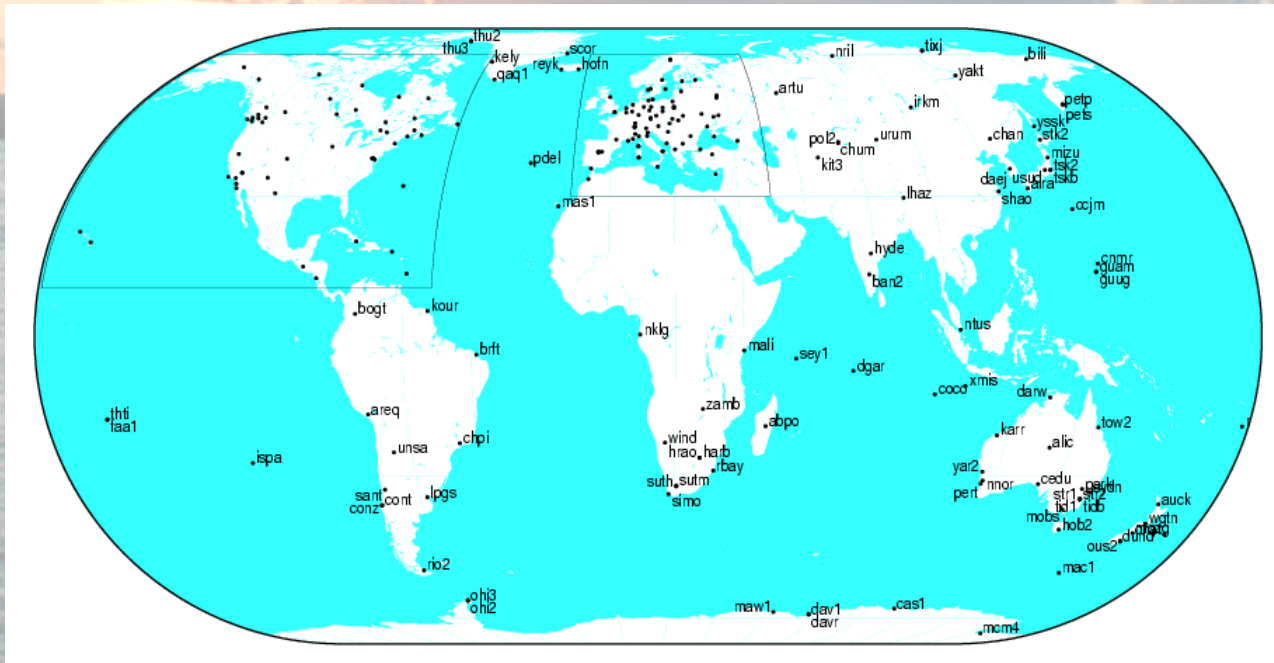
June 2-6, 2008
Miami Beach, Florida, USA

Overview

- IGS is a voluntary federation that pools resources and data from permanent GPS & GLONASS stations to generate precise GPS & GLONASS products.
- IGS provides the highest quality data and products.
- NOAA/ESRL considers IGS products to be the “gold standard” when it comes to GNSS applications in support of Earth science research and multidisciplinary applications such as atmospheric remote sensing.

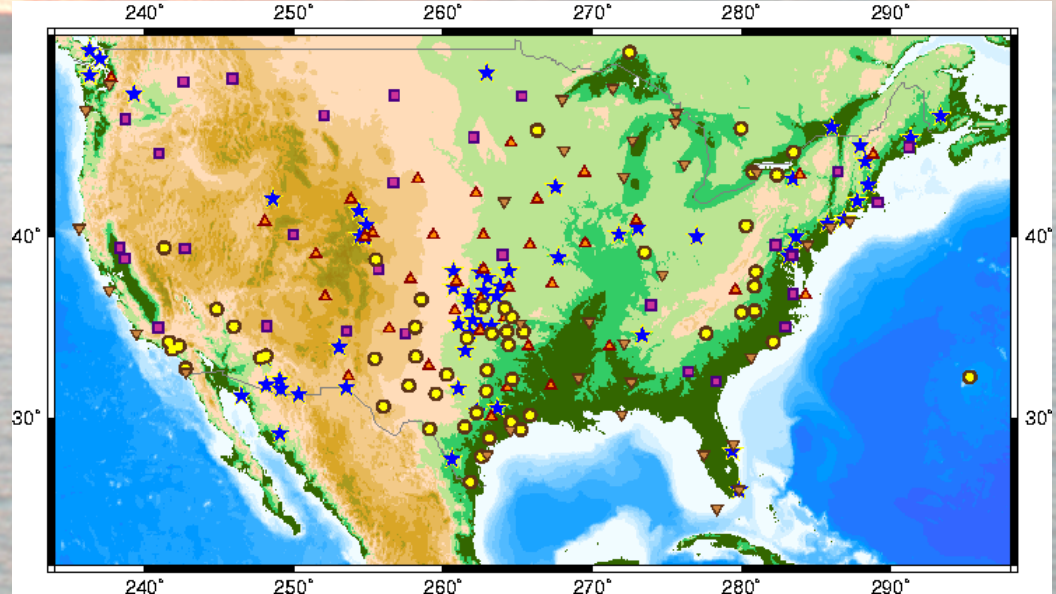
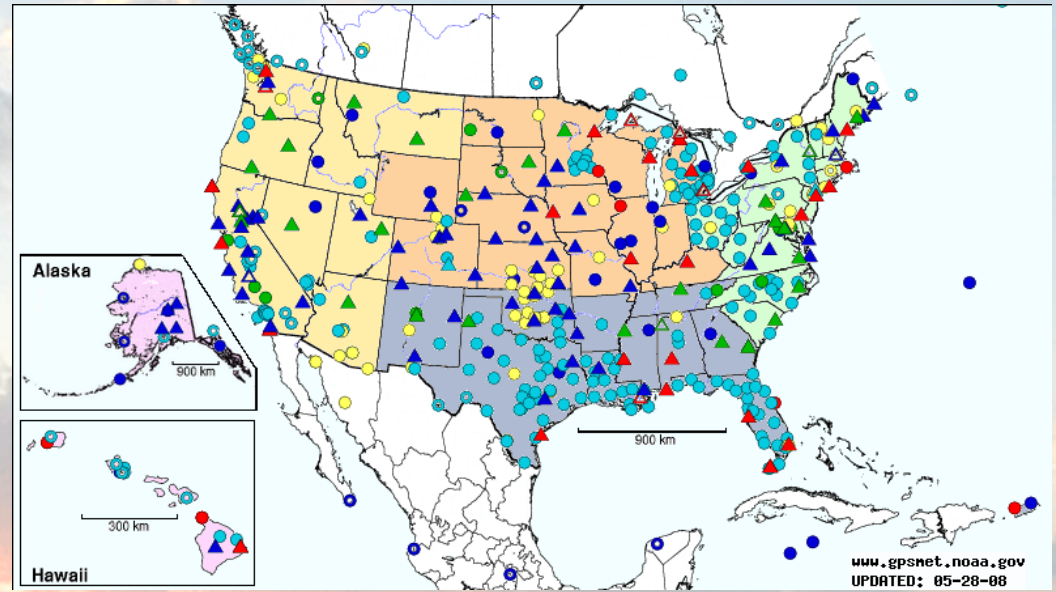
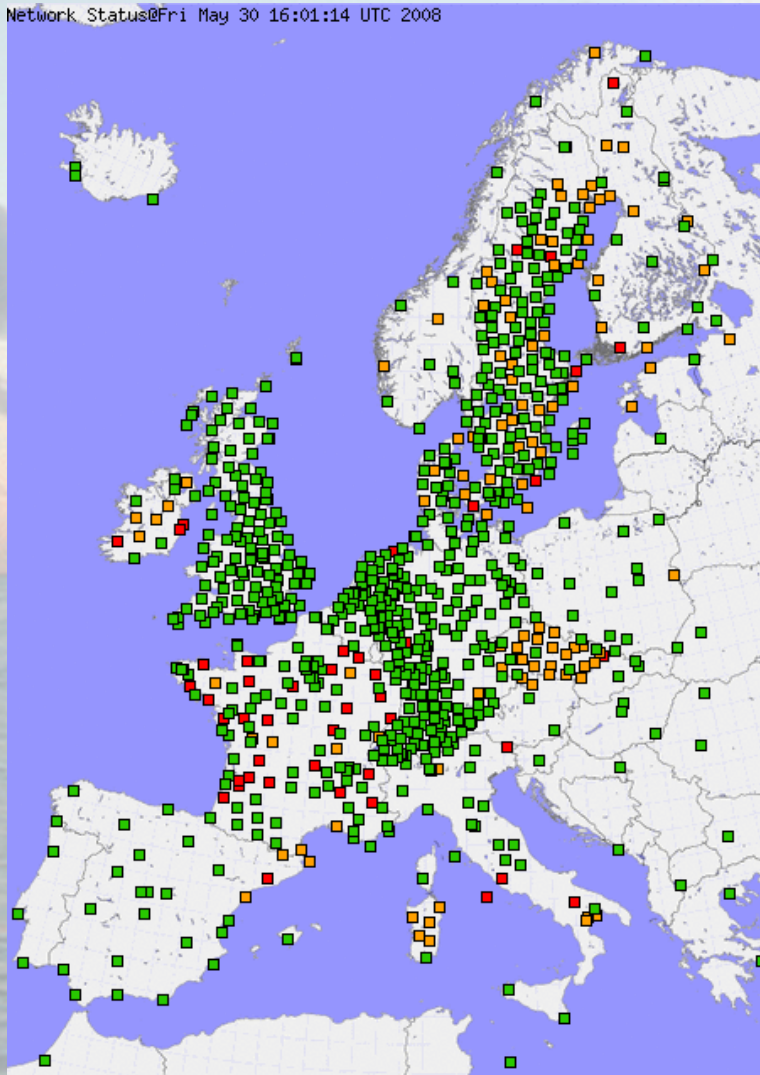
Current IGS Tropospheric Products

Description	Precision	Latency
Ultra-Rapid tropospheric zenith path delay	6 mm	2-3 hours
Final tropospheric zenith path delay	4 mm	< 4 weeks



RT/NRT Tropospheric Products Are Now Produced Worldwide

Network Status@Fri May 30 16:01:14 UTC 2008



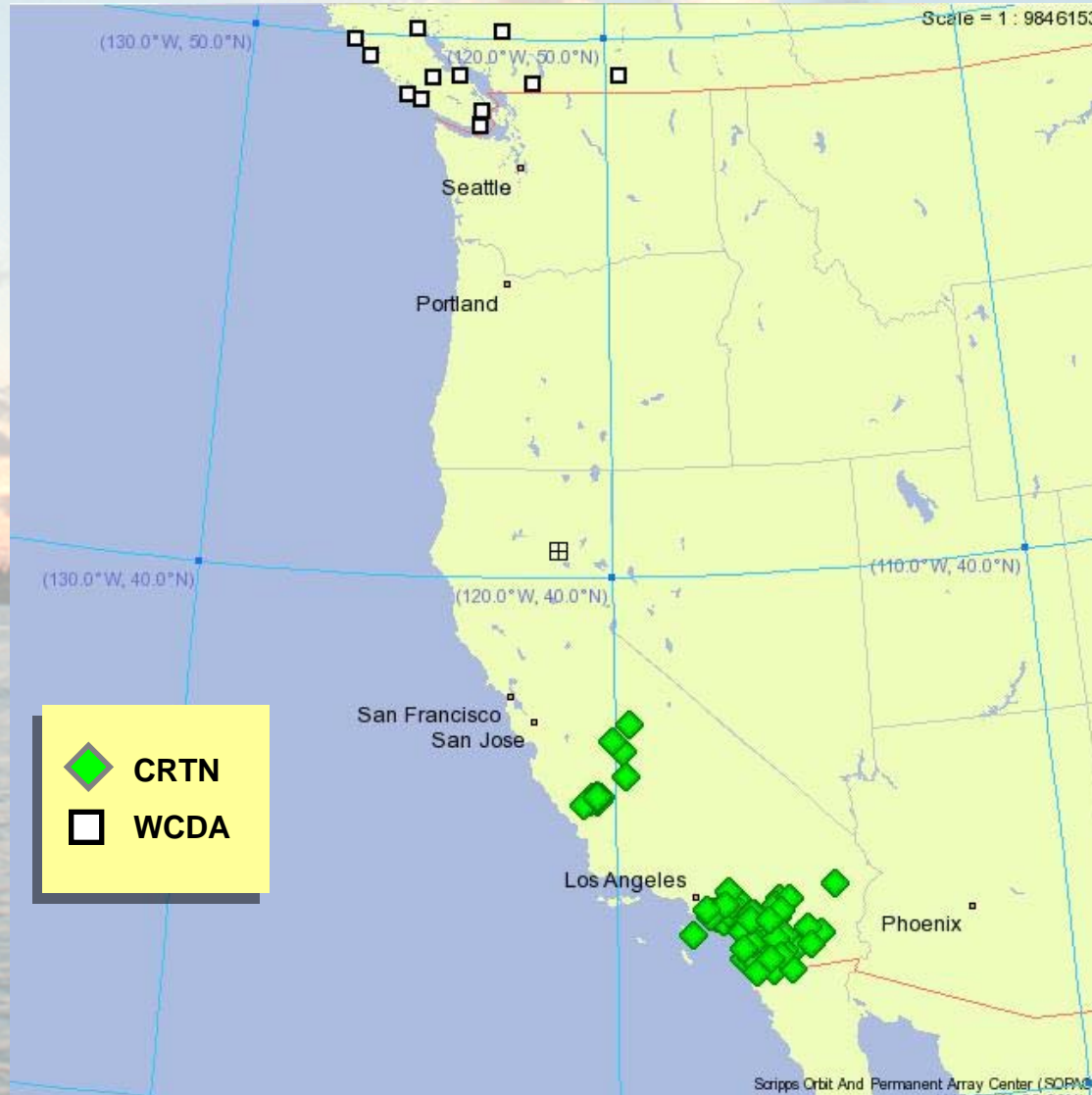
RT/NRT Tropospheric Products Are Now Produced Worldwide

- Europe E-GVAP 0.25-h
- United States NOAA 0.5-h
SuomiNet 1.0-h
- Taiwan CWB 2.0-h
- Japan GEONET unk
- China CMA unk
- Korea KMA unk
- Others TBD unk

IGS Products are the Common Denominator

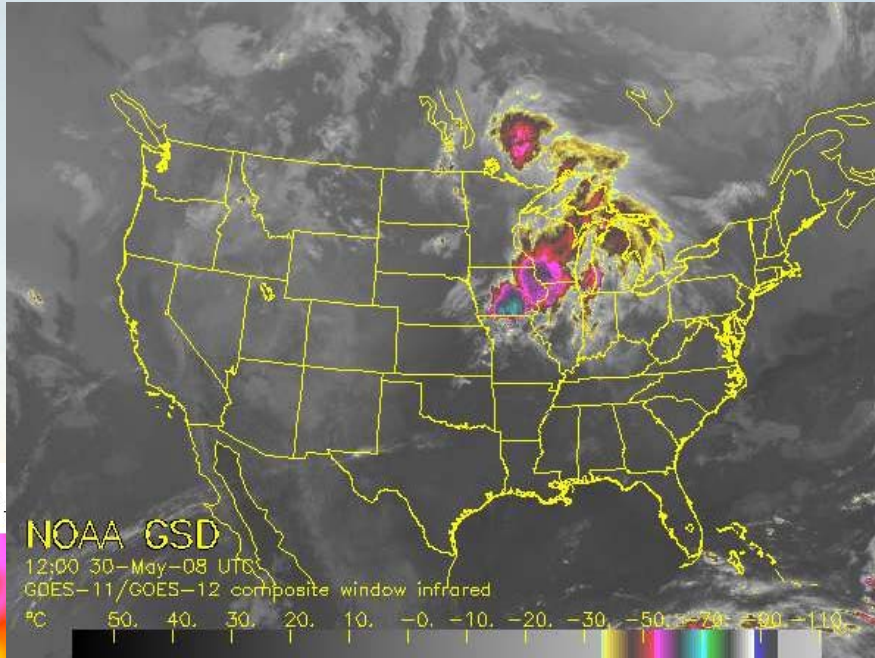
- All of these networks utilize IGS work-products including:
 - IGS Station Coordinates
 - GPS Satellite Ephemerides/Satellite & Station Clocks
 - Earth Rotation Parameters
 - Antenna Phase Center Models.
- IGS acts as an enabler of world-wide scientific and technological innovation.
- The science and technology of producing RT/NRT tropospheric products is fairly mature.
- GNSS networks around the world are currently transitioning from R&D into operations.

RT/NRT Tropospheric Products Are Now Used Quasi-Operationally

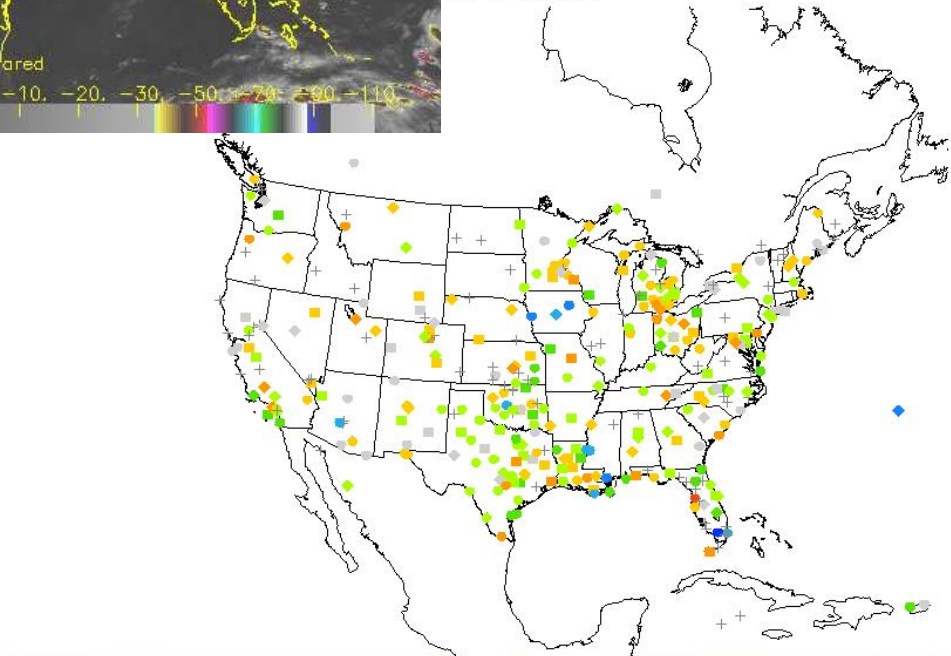
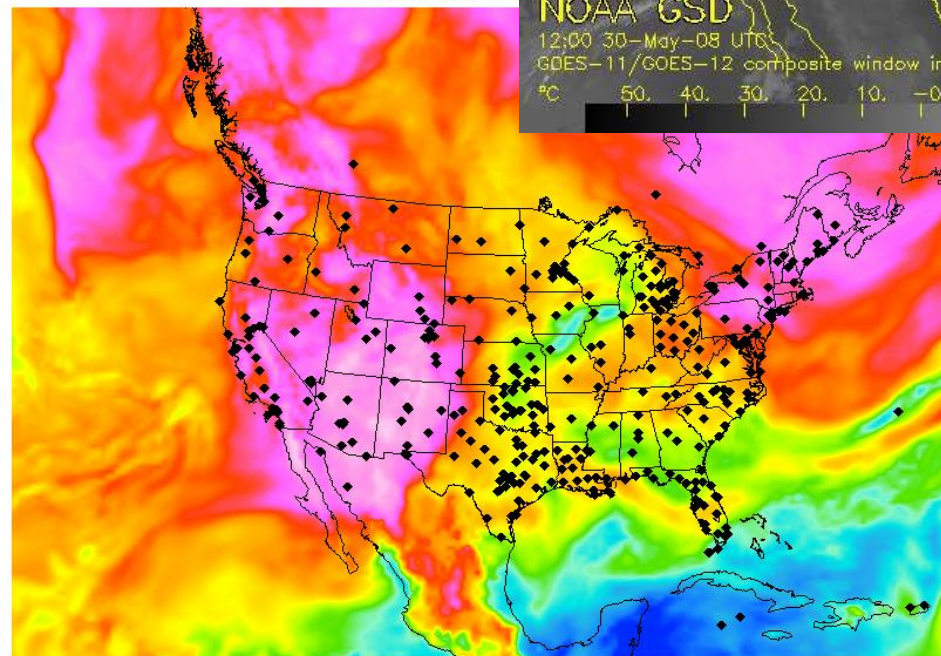


NOAATrop Model Constrains CRTN & WCDN

NAM - 40 km
Valid: 30-May-08



Greatest Differences - Analysis
-May-08 12:00 UTC



>0.0 >5.0 >10.0 >15.0 >20.0 >25.0 >30.0 >35.0 >40.0 >45.0 >50.0 >55.0 >60.0 >65.0

Nam - 40km Mean: 0.02 RMS: 1.62 No. Comp: 276

< -9. < -7. < -5. < -3. < -1. 0 > 1. > 3. > 5. > 7. > 9.

Model Drier than GPS
 ◇ Nam - 40km Closer to GPS: 127
 ○ Operational RUC Closer to GPS: 66
 □ Research RUC Closer to GPS: 83
 △ GFS 0.5 deg Closer to GPS: -999

Model PW Error (mm) = Model - GPS
 Mean: 0.02 RMS: 1.62
 Mean: 0.34 RMS: 2.28
 Mean: 0.17 RMS: 1.70
 Mean: -999 RMS: -999

Model Wetter than GPS
 No. Comp: 276
 No. Comp: 276
 No. Comp: 276
 No. Comp: -999

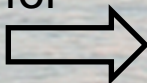
Two Questions for Discussion

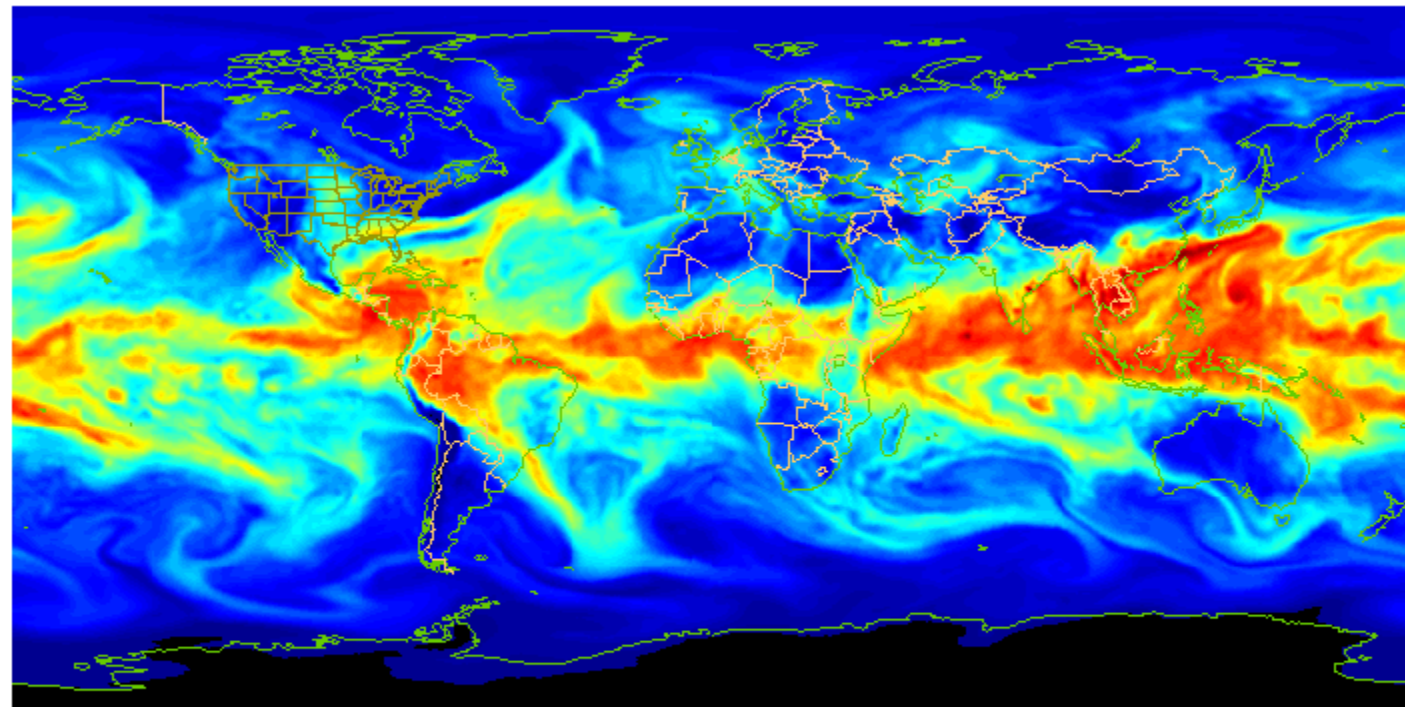
- Given that RT/NRT tropospheric products are now routinely produced by non-IGS entities, and
- Given that the number of these entities will likely grow in the future:
 - Are IGS RT/NRT tropospheric products redundant?
 - If not, what purposes do they serve?

There is a Need for IGS RT/NRT Tropospheric Products

- IGS RT/NRT tropospheric products would provide independent points of comparison around the world.
- Their purpose would be to verify and validate local-regional RT/NRT tropospheric signal delay estimates.
- Local-regional RT/NRT networks would have to incorporate one or more IGS sites as fiducials.
- The IGS products would be used for quality control and to help identify problems in local-regional applications requiring RT/NRT tropospheric estimation.

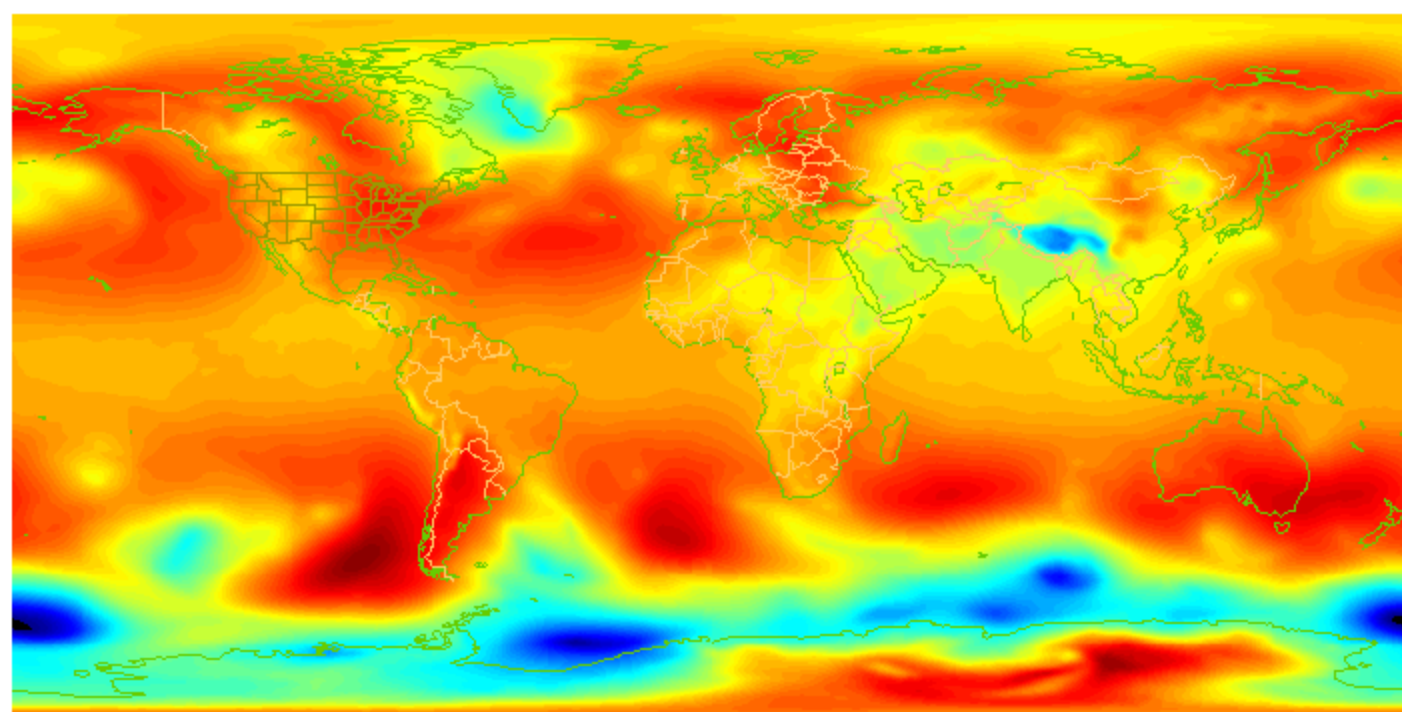
What Would a Global IGS RT/NRT Tropospheric Product Look Like?

TPW
as a proxy for
ZWD 



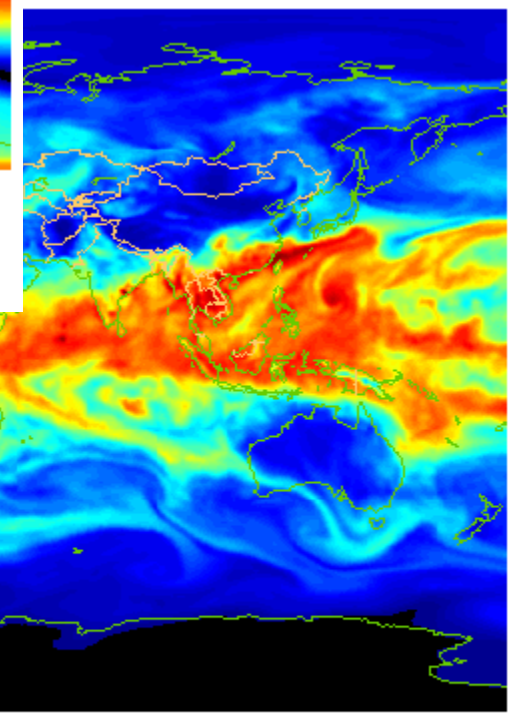
NOAA / ESRL / GSD FIM (iso) 29-May-2008 12:00:00 0 h fcst PWAT sfc anl
PWAT UNLIMITED



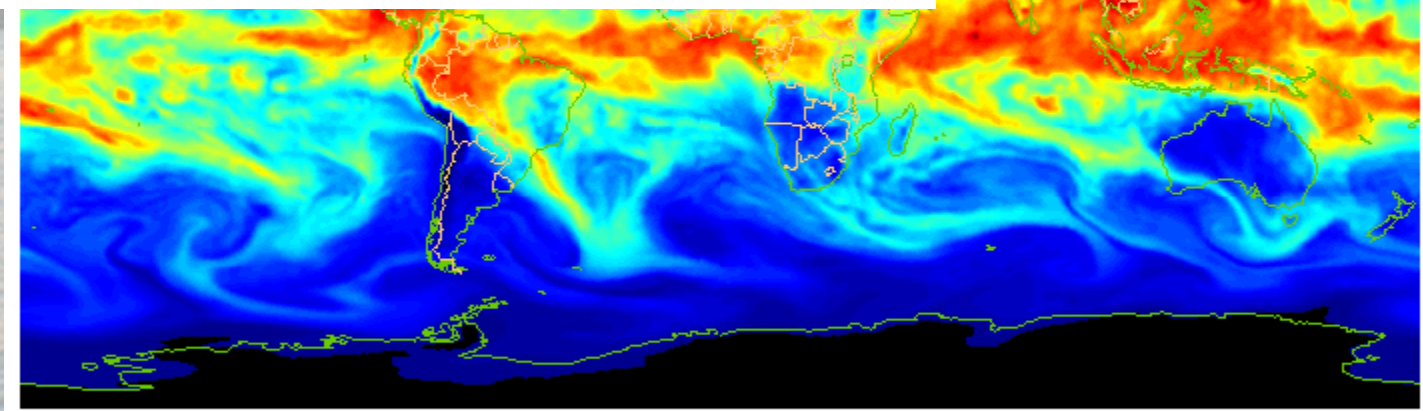


ALT
as a proxy for
ZHD

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MSLMA >= 94000
95000 98000 100000 102000

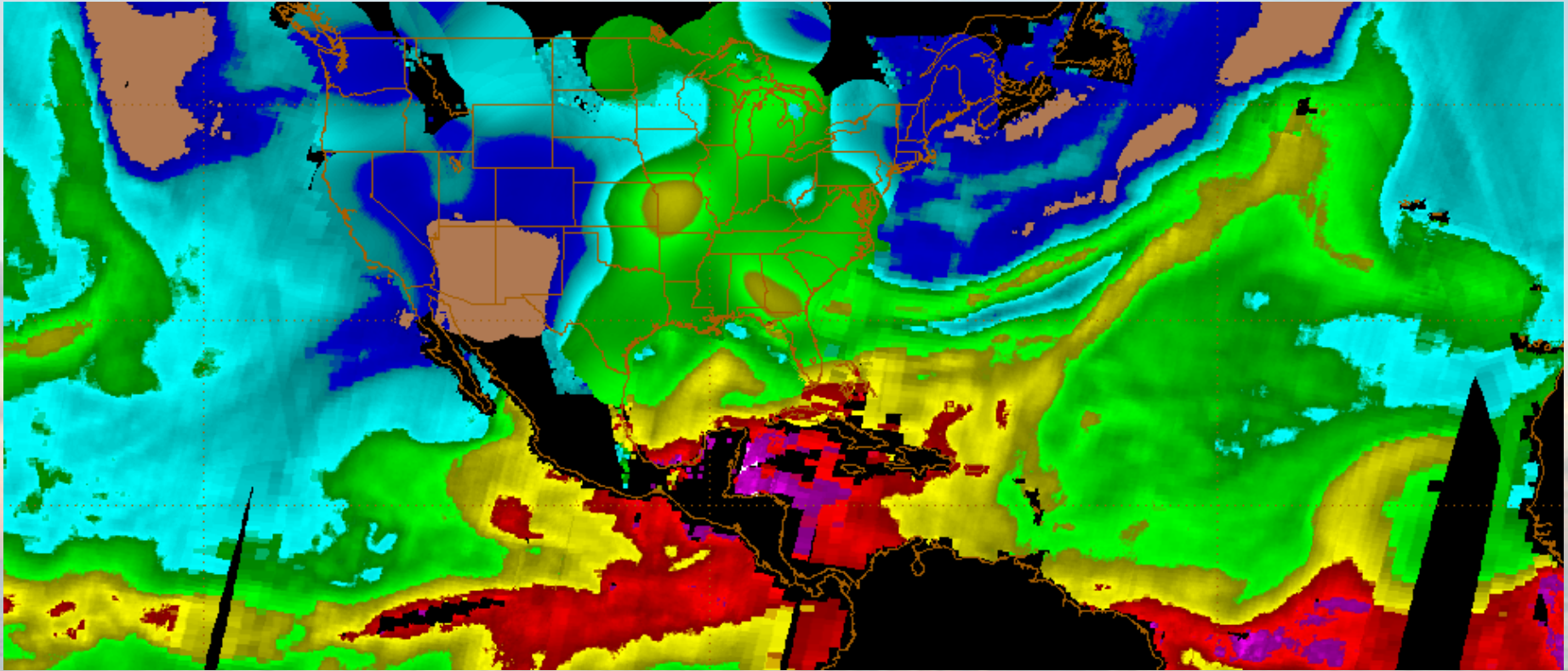


TPW
as a proxy for
ZWD



NOAA / ESRL / GSD FIM (iso) 29-May-2008 12:00:00 0 h fcst PWAT sfc anl
PWAT UNLIMITED
10 30 40 60

Where Would the Observations Come From?



An experimental NOAA blended TPW product using satellite passive microwave measurements offshore and GNSS observations on shore.

Is This Something IGS Wants or Needs to Do?

- Where will the observations come from?
- What spatial resolutions are needed over what domains?
- How will the observations be analyzed and who will analyze them?
- What maximum ZTD errors can be tolerated?
- Who will produce and distribute the products?
- What are the verification/QC issues?
- Who is going to use them?
- How will they be used?

Thank You for Your Attention!

Any Questions?

