TRUE REAL-TIME

True real-time generated tropospheric delays are instantly available for now-casting with applications for flash flood warnings.

NEAR REAL-TIME

When real-time streaming data is not available, RTNet can be run in a near-real-time mode (NRT) where data can arrive in file batches, for example, every 15, 30, or 60 minutes. In NRT mode RTNet processes one file interval and then waits until the next file interval arrives without resetting carrier phase ambiguities or the filter solution. This is the most efficient near-real-time processing mode, resulting in lower latency and computer demand, than reprocessing hours of data or equation stacking techniques.

POST-PROCESSING

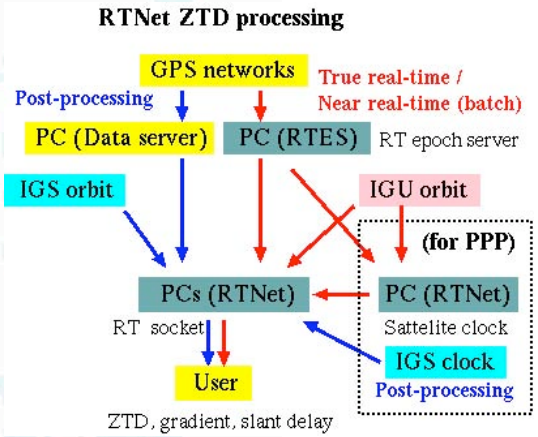
Post-processing is also available with RTNet. IGS final products should be used to get the best estimates for climatological studies.

NETWORK AND PPP

RTNet estimates the tropospheric zenith delay, the horizontal gradients, and the station to satellite slant delays in real-time. This can be done in PPP mode or in network mode. PPP mode requires accurate satellite clocks which can also be generated by RTNet in real-time.

PROCESSING AND MODELS

Feature	Comment
True real-time	True real-time "stream" processing
Near real-time	Seamless processing in file mode
Post-processing	Possible with RINEX files
Orbits	Precise and/or broadcast orbits
Network mode	With "lambda" ambiguity resolution
PPP	Yes
Mapping	Wet / dry GMF, Niell,
Clocks	Satellite and receiver clocks
Tropospheric model	Zenith delay & gradient parameter
Slant delay	Yes



Additional Information:
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Atmospheric Processing & Products

GPS - Solutions Inc.

RTNet

- Accurate
- Reliable
- Versatile
- Easy-to-use

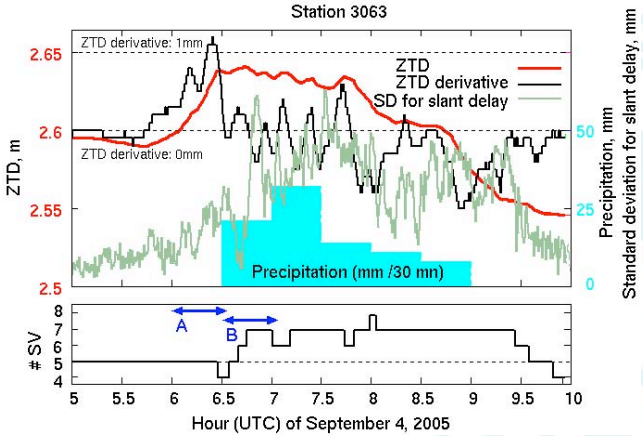
Real-time Analysis

GNSS Software System

ZENITH DELAY

All of Japan's 1300 – station GEONET network can be analyzed by RTNet every 30 seconds in real-time with just one PC-type computer even in network processing. Computational cost for RTNet processing is relatively low.

Zenith tropospheric delay (ZTD) is estimated from GPS independently of any meteorological observation. RTNet estimates ZTD with sub-second to several minute resolution using sophisticated square root filtering. Such frequent ZTD estimates and its derivative can help current now-casting system for severe rainfall prediction.

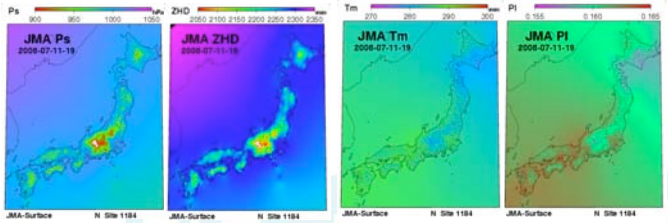


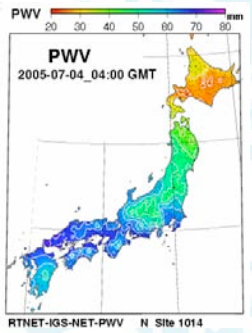
Applications for Service Providers and Uses

- To generate real-time ZTD corrections for low-cost L1/CA receiver positioning and other space-based observations
- Now-casting of severe rainfall and lightning
- Data assimilation (DA) to numerical weather model

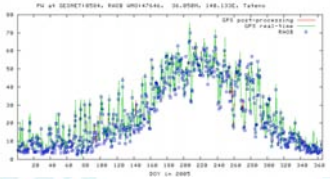
WATER VAPOR

Precipitable water vapor (PWV) is computed from ZTD and surface pressure and temperature. Bi-linear interpolation from a surface meteorological observation network or gridded information from weather forecast can be used if no in-situ meteorological observation is available at the GPS station.





Long-term comparison for one year in 2005 with 18 radiosonde stations (13,000 radiosonde launches) in Japan shows no significant differences of biases between post-processing and real-time processing. The agreement of RTNet real-time PWV with radiosonde PWV is better than previous comparison research with post-processing in Japan.

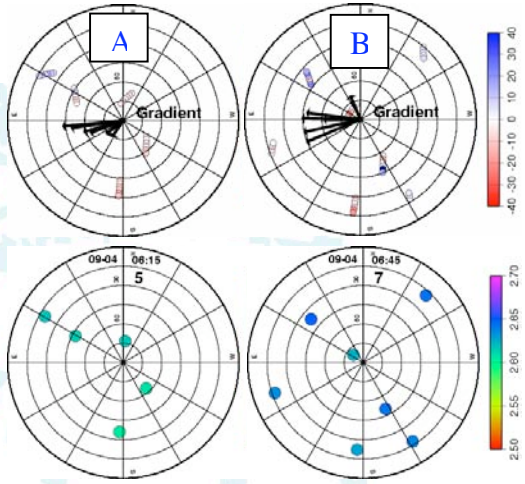


Orbit	Bias, mm	RMS, mm	Standard deviation, mm
IGS final	1.20	2.41	2.09
IGU predicted	1.26	2.58	2.25

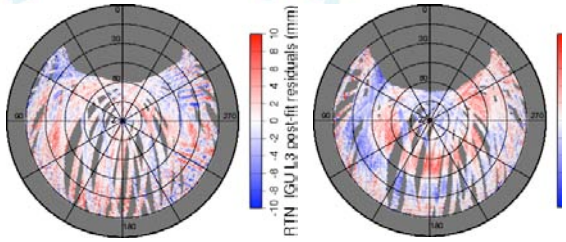
Additional Applications for Users:

- Monitoring of PWV over the network
- Water budget and climatological studies

SLANT PATH DELAY



Station-to-satellite slant delay is retrieved from ZTD estimates and phase post-fit residuals (top). Slant delay shows strong inhomogeneous distribution of water vapor during rainfall events (left and right maps show slant delays before and during a torrential rainfall event).



Slant delay statistics are useful for quality check of phase observations for GNSS network deployment. Strong multipath noise (left) and biases due to inaccurate PCV model (right) can be detected. We can reduce such multipath errors from slant delay by subtracting such systematic biases.

Additional Applications for Users:

- DA into high-resolution model
- Water vapor tomography