Needed changes to the IGS Combined trop products

The problem: dearth of users of IGS trop products (either external or ACs), exacerbated by high cost of production

- Product for each site is based on weighted mean of trop solutions contributed by ACs for each site
- Two products: Final (weeks latency), and UltraRapid (5-6 hrs)

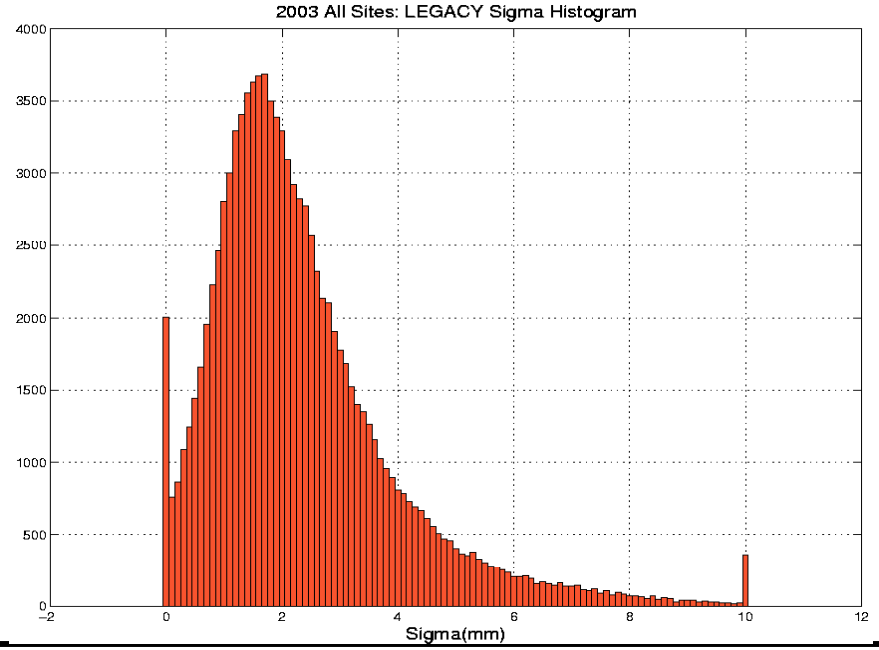
Approach: identify potential causes for the lack of usage and make the necessary adjustments to the product

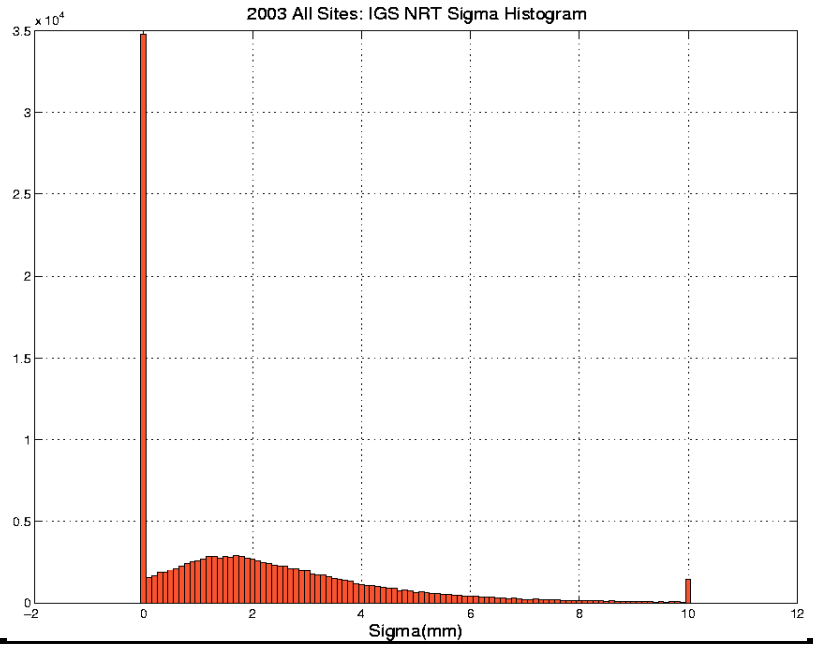
The solution: a new 'combined' product derived from the IGS Combined orbit and clock solutions with point-positioning

- Non-traditional approach to combination
- Many advantages outweigh minor disadvantages
- Let's give it a try. We have nothing to lose

Potential Problems With Present Products and the Necessary Adjustments

Problems	Required adjustments
1. Low climatological value due to temporal inconsistency as individual ACs change their estimation strategy	Product must be temporally consistent, and easily regenerated as estimation strategy evolve
2. Products may not be sufficiently accurate as it depends on contributions with uneven quantity and quality	Products must be consistently of high quality





Potential Problems With Present Products and the Necessary Adjustments (cont.)

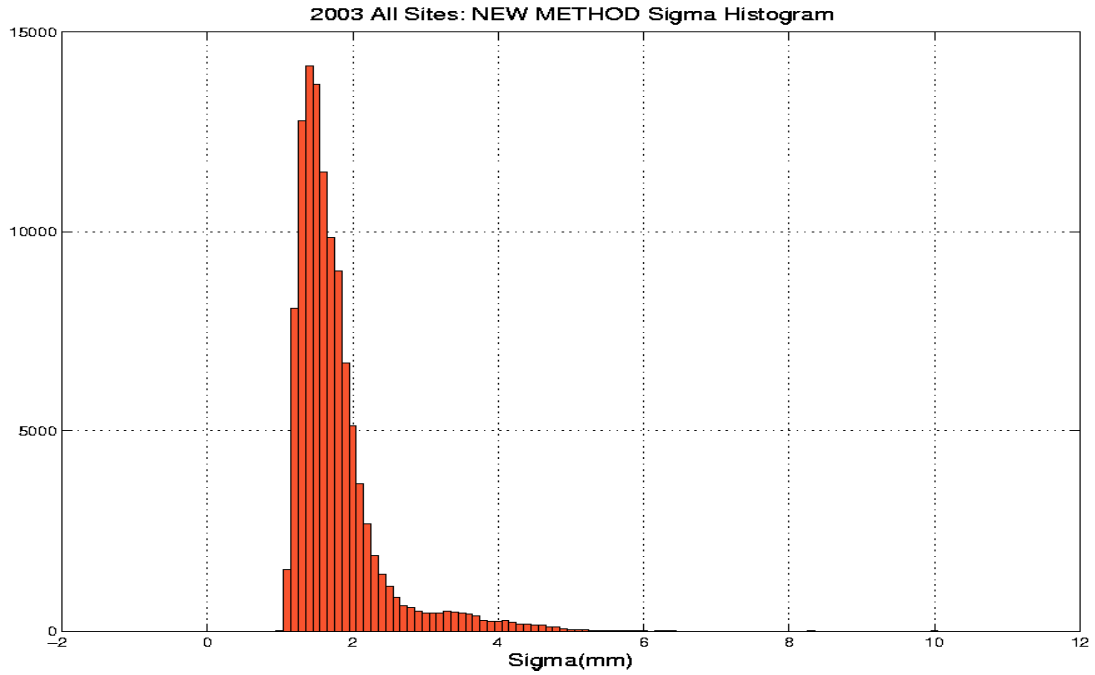
Problems	Required adjustments
3. Integrity compromised because formal errors are based on inter-comparisons which tend to hide common error sources. Many 0 sigma cases	Rigorous formal errors derived from input. Periodic comparison campaigns with independent techniques (WVR, Radiosondes)
4. UR product too sparse for weather forecasting applications	Capacity for massive production of essentially all sites
5. UR product too late for weather forecasting	Latency must be at most 15 - 30 minutes, preferably 0.5 hours or less
6. Reluctance of operational users to outsource TZD production because of reliability and quality concerns. Confidence in in-house ability to produce good TZD estimates.	Demonstrate consistently high quality and reliability.

Advantages Offered by the Proposed new Product

1. Highly efficient PPP enables massive production and daily solutions of all IGS sites.

2. Uniform estimation strategy insures long-term consistency. Enables quick reanalysis when estimation strategy changes

3. More accurate and more robust than present product



Advantages Offered by the Proposed new Product (cont.)

4. Better quality control through many rigorous metrics: formal errors, residuals, position repeatability

5. Arbitrary temporal resolution (up to Rinex file resolution), nominally 5 minutes, is more suitable for weather forecasting applications

6. Technique is easily applicable to lower latencies

7. Offers contributing ACs a high-quality, well characterized product to compare with

Summary of Recommendations

1. Replace the current IGS Final trop product with a higher quality, higher efficiency Final product based on the IGS Combined orbit and clock solutions

2. Discontinue the current IGS UR trop product for lack of use (leave operational weather forecasting applications to regional networks)

3. Carry out periodic and regular comparison campaigns with independent techniques (WVRs, radiosondes), and other GPS solutions

4. Immediately reprocess 10-12 years of data from all IGS sites to establish long-term consistent climatology

Calibration of Meteorology Sensors in the IGS Network: the Problem

The good: met sensors collocated with GPS receivers provide useful value operationally (for weather forecasting and climatology) and as a research and development tool.

The bad: to be useful the sensors must be routinely calibrated (barometers are typically factory-certified for 3 years)

The ugly: There are dozens (> 70) of met sensors in the IGS network. Most, if not all have never been calibrated.

Problem statement: we have invested a lot of resources in acquiring and deploying these sensors, but what does a responsible scientists suppose to do with these un-calibrated sensors? The problem gets worse every year

Calibration of Meteorology Sensors in the IGS Network: Potential Solutions

Potential solutions:

1. Do nothing. Minimize usage of met sensors, hope reviewers of your scientific papers don't ask about calibration of your sensors

2. Perform 'remote' calibration by comparing long time series of sensor data with weather-model-based averages. This works well in relatively flat, well modeled areas

3. Invest the effort and resources to calibrate the sensors in your network. Requires expertise.

4. Pull IGS resources and hand management of calibration to a single organization (e.g. UNAVCO). Realize small saving in cost due to economy of scale. Gain peace of mind.

5. Try to get weather bureaus to take ownership of the sensors, and apply their considerable resources and expertise to their maintenance

Recommendations

1. Short term: Request input from the community about interest in the problem, preference of solutions
2. Long term: Work with the World Meteorological Organization on the transfer of ownership of met packages to weather bureaus (with help from Seth Gutman, NOAA/FSL)