

# IGS Task Force for the Format Standard of Product Combination Statistics

Dec. 16, 2025 (virtual)

## Participants

Rolf Dach, Jianghui Geng, ~~Masoumi Salim~~, Pascal Stebler, ~~Thomas Herring~~, Simon Banville, Lotfi Massarweh, ~~Michael J. Coleman~~, Zhiguo Deng, Paul Rebischung, Radosław Zajdel, Jiang Guo, ~~Loyer Sylvain~~, Markus Bradke, Bingbing Duan, Bin Wang, Qiang Wen, Qingfeng Wu, Yahao Zhang

## 1. Purpose

The meeting introduced the objectives of the task force and the preparatory work on combination statistics carried out by the WCC, and also included discussions on the task force's future plans.

## 2. Point of Discussion

Presentation on the preparation work of the combination statistics by J. Geng:

- The goals of the task force are to facilitate ACs to easily inspect their products' artifacts and PPP uses to easily exclude outlier products, as well as provide auxiliary scripts to plot the combination statistics
- The combination statistics are going to include meta data (AC-specific product information, combination strategies, etc.), orbit combination information (Helmert parameters, consistency across ACs, weights and outliers), clock combination information (Consistency across ACs, weights and outliers) and bias combination information (Observable codes or signal frequency, consistency across ACs)

Discussions on the task force:

- **S. Banville:** The concern is what we combine would fit into the new proposed format (e.g., DCB combination, Melbourne Wubenna bias combination) There are a lot of open source package to read/write JSON files. Users don't have to write parsers from scratch.

**J. Geng:** We have not yet fully considered how to represent combination statistics, especially multi-frequency phase and code biases in a standard format.

Dual-frequency cases are relatively straightforward, extending this to multi-frequency biases will require further format design and discussion.

- **L. Massarweh:** 1) The target users affect the choice between JSON format and SINEX format, a SINEX-like format may be preferable for readability and long-term stability. 2) agree with the remark that phase bias needs to be account in a multi-frequency case to remain future-proof. 3) Regarding the structuring of the statistics, using product types as level-1 headings provides greater flexibility and helps accommodate changes in ACs over time. 4) Why the CLS files are only from IGS combination whereas the SUM files are also from many ACs, sometime over 7 days, sometime 1 day?

**R. Dach:** The weekly SUM files provided by some ACs are free formatted with some information that ACs want to provide. Then the ACC takes the clock combination for each day and produce the 7 CLS files weekly.

- **M. Bradke:** JSON is a format that every programming language can read immediately, it can be put into the Grafana dashboard to observe if there are any discrepancies for our solution versus the combined solution. The JSON format can also have a minified version, which is in one line, whose size are about 20% of you presented. And JSON is much easier to extend if you have other features in the future.

**J. Geng:** The SINEX format is more readable for PPP users to identify problematic products. We are going to provide some auxiliary scripts to translate the SINEX file into JSON format to facilitate ACs to monitor their products.

- **P. Stebler:** We should postpone the discussion about which format exactly to use rather to the end when you really know what you have to put in the statistics and how complex these datasets are
- **R. Dach:** Do we ask too much when we want to serve the ACs for quality

assessment and PPP users for a detailed and automated quality assessment, and in the end, you want even something which is plottable. We should first become clear what we want to have at the end.

**J. Geng:** Yes, it much more complicated compared to the existing CLS file, because it contains many more indices to quantify the quality of each AC's products.

- **P. Rebischung:** 1) It should also include statistics from the ERP combination and station position combination in one single format. 2) YAML format is also a machine-readable format, it is less busy and much easier to read by human as well.
- **R. Zajdel:** agree with as Paul already said, YAML file is also pretty looking and easily readable. Maybe we can provide two files, one of which is machine readable and another one is human readable.
- **J. Guo:** JSON is a mature format and you can easy to extend to have more information in the future.
- **B. Wang:** JSON is machine readable and easy to transform into other formats.

### 3. Action Items

The following new action items were agreed and should be addressed before the next task force meeting:

- **251216 (B. Wang):** investigate the YAML format for the combination statistics.
- **251216 (Y. Zhang):** add ERP combination and station position combination into the statistics.

### 4. Next meeting

A next video conference is suggested for February 2026. An invitation with detailed time and preparatory material will be sent in due time before the event.