

Operational combination of monthly GRACE-FO gravity field models

Since July 2019, the Astronomical Institute of the University of Bern (AIUB) operates the Combination Service for Time-Variable Gravity Fields (COST-G) of the International Association of Geodesy (IAG). COST-G first performs a quality control, analysing the signal content of the gravity fields provided by the GRACE-FO Analysis Centres (ACs), and then generates a combination. Thereby relative weights are determined and used for the combination, which reflect the signal-to-noise ratio of the individual gravity fields in the case of consistent signal content of all contributions.

As the combination of the monthly gravity fields determined from observation data of the GRACE satellite mission (2002-2017) was carried out in a reprocessing mode, i.e., after ending of the mission and on consistently generated time-series of all ACs, COST-G now faces a new challenge: the operational combination of the monthly gravity fields derived from GRACE-Follow On (GRACE-FO) with short latency.

In November 2020, two years after the launch of the GRACE-FO satellites in May 2018, the combination at COST-G became operational. These two years were used to consolidate the satellite operation, the observing system, and the generation of scientific products from the raw data at the ACs. The following ACs participate in the COST-G combination: the GRACE-FO Science-Data-System, i.e., CSR, JPL (both from the USA) and GFZ (Germany), the COST-G ACs that already contributed to the GRACE combination, namely AIUB, GRGS (CNES, Toulouse), ITSG (University of Graz) and – as a new contributor – LUH (Leibniz University of Hannover).

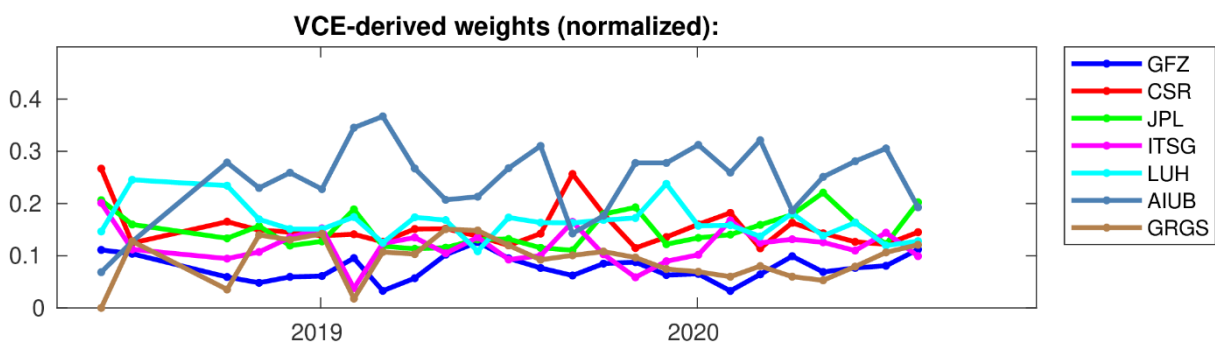


Figure 1: Relative monthly weights of all gravity fields contributing to the combination.

Figure 1 shows the relative monthly weights of all ACs and, on the one hand, provides evidence for the remarkable consistency of the individual time-series, on the other hand features outliers, which are an indication of the challenges still present in the analysis of the GRACE-FO data at the different ACs. To take the ongoing development of the processing methods into account, the operational COST-G combination does not insist on a consistent set of standards, but considers all gravity fields that are provided by the ACs within two months after the availability of the observation data.

The high weights of its time-series in the combination prove the quality of AIUB's contribution. Figure 2 displays a noise assessment of the individual time-series and of the combined gravity fields. The combination reveals a very favourable noise level that is only surpassed by the contribution from ITSG. Comparing the noise assessment with the relative weights in Figure 1, it becomes evident that an efficient noise suppression may also impair the signal content, as indicated by the relatively low weights assigned to the ITSG contribution. The reasons for these discrepancies are currently under investigation. The combined gravity fields and further background information on COST-G may be found on <https://cost-g.org/>

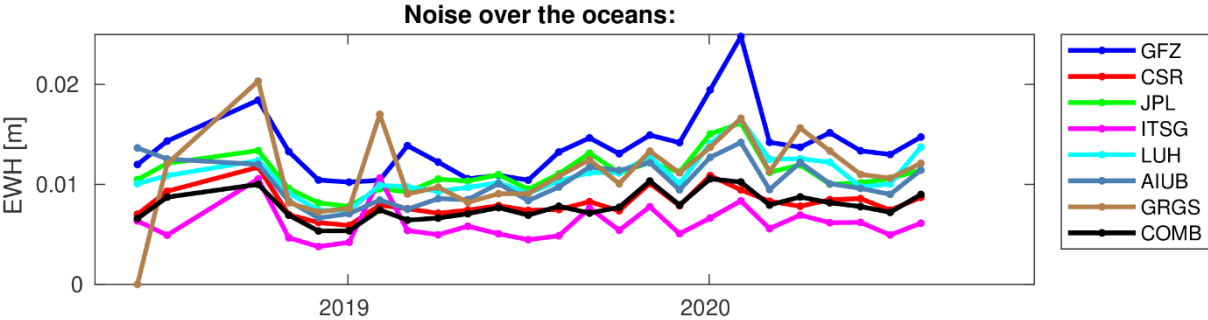


Figure 2: Assessment of the noise content of all time-series contributing to the combination.