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## Study on the Variance Component Estimation in relative weighting of the Inter-Satellite Links and GNSS observations for orbit determination

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This research aims at evaluation of the Variance Component Estimation (VCE) to derive a combined orbit solution from the Inter-Satellite Links (ISLs) and GNSS measurements. The ISLs provide precise range measurements between satellites in the specific GNSS constellation which is one of the key requirements for improving accuracy and reliability of the orbit determination. Our investigation based on various ISLs connectivity schemes (observation scenarios) indicates that by using ISLs measurements in addition to GNSS observations, it is possible to improve orbit estimation mainly by reducing RMS errors in cross-track and along-track directions.

This study, however, is focused on comparison of weighting methods based on presupposed measurement accuracies (described here as an empirical weighting) and four approaches to the VCE method. VCE is a method used to determine proper weighting factors for different types of measurements, e.g. of diverse nature or based on distinct techniques and thus of various accuracy. It is expected that systematic and random errors of the individual solutions could be reduced by this combination method. In this simulation-based study we assess orbit solutions using both types of weighting with a few approaches to the empirical weighting as well as to the VCE. In parallel, we evaluate properties of the simulated ISLs measurements including the connectivity schemes and observation accuracy.

This work is concluded with general advantages and disadvantages of proposed weighting methods along with the observation scenarios, that are potentially optimal for better orbit and clock estimates using ISLs and GNSS observations.