Fast integrated estimation of huge GNSS global networks

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In the GPS data analysis, due to computing time and limited computer memory, large networks are usually divided into sub-networks, processed separately and then combined on the normal equation (NEQ) level. For the same reason, an integrated analysis of ground- and space-based GPS data can only be carried out on computers of high performance. This conflict between high-quality products and computer resources becomes more and more critical with the growing ground networks, the increasing number of low earth orbiting (LEO) satellites and the upcoming GALILEO system. One of the major reasons for this conflict is that a huge number of ambiguity parameters have to be kept in the NEQ for integer ambiguity fixing.

In the presented strategy, parameters defined over a time interval shorter than the whole session length, for example, ambiguity and zenith tropospheric delay parameters, can be eliminated immediately after all related observations have been contributed to the NEQ even for ambiguity-fixed solution. It reduces the requested memory and computing time dramatically from that of the current methods.

We will demonstrate that with the new strategy a huge IGS network up to 250 stations can be analyzed on a PC with 1 GB memory, and that the computing time can be reduced to one third of the current method. We will also show the differences between our IGS products from the integrated estimation and the sub-network strategy.