



Status and Perspective of the IGS Multi-GNSS Experiment (MGEX)

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Following three decades, during which the Global Positioning System GPS has evolved from a military navigation system into an indispensable tool for geodetic research and global monitoring of the Earth, the world of satellite navigation has experienced dramatic changes over the past years. With GLONASS, a second global navigation system has achieved a fully operational status, GPS is introducing modernized civil and encrypted navigation signals, and a variety of new navigation constellations are being built-up in Asia and Europe. These include BeiDou, which has recently opened a regional navigation service in the Asia-Pacific region, Galileo, which now has four satellites in orbit, as well as QZSS, which offers a unique set of signals and service features.

In recognition of a rapidly changing GNSS landscape, the International GNSS Service (IGS) has initiated the Multi-GNSS Experiment (MGEX – <http://igs.org/mgex>) as a platform for early familiarization with emerging navigation systems and to pave the way for a full-featured use thereof in a future multi-GNSS service. As a first step, MGEX has promoted the build-up of a new global network of GNSS monitoring stations, each tracking at least one new constellation (Galileo, BeiDou, or QZSS) on top of GPS, GLONASS and SBAS. By the end of 2012, approximately 50 stations contribute offline and/or real-time data to the MGEX network. To facilitate introduction of new standards (specifically RINEX3 observation and navigation data formats), distinct data archives are used even for those MGEX stations jointly contributing to the legacy IGS.

Building-up on the new multi-GNSS network, the generation of associated orbit and clock products has started in the second quarter of 2012. At this stage, only Galileo and QZSS products are offered by selected MGEX Analysis Centers, but the addition of BeiDou is expected in 2013 as the MGEX network expands and new Analysis Centers join the data processing effort.

Despite remarkable progress in the first year of the MGEX project, numerous challenges have still to be met before the new constellations can contribute to high-grade navigation and geodetic services. So far, only an immature knowledge of the new navigation satellites and the transmitted signals is available. Much work is left to fully characterize the multitude of inter-signal, inter-frequency and inter-system biases, as well as antenna phase patterns in both the space and user segment. Likewise, proper knowledge of spacecraft attitude control and radiation pressure models appears indispensable for a proper generation of highly-accurate orbit and clock products. Only then will users be able to fully benefit from the high potential of robust, wide-band, and high navigation signals as well as new generations of highly stable clocks offered by the new constellations.

Within the presentation, the MGEX project will be introduced and the latest achievements in the network build-up, the product generation and related activities will be presented. Current challenges and necessary steps towards a full-features multi-GNSS service of the IGS will be identified.