The benefits of combined processing of observations from different Global Navigation Satellite Systems

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The Galileo GNSS and the modernisation of the existing GPS and GLONASS systems will offer many exciting opportunities and challenges in the field of geosciences in the next decade. However, in order to obtain any positive effects on our geodetic and geophysical estimates the different GNSS systems will have to be observed by multi-system receivers that track all systems on all available frequencies. Furthermore, these receivers should not introduce any biases between the tracked GNSS observations. In addition to this we need analysis software that can efficiently handle these multi-system and multi-frequency observations in one single estimation process. Over the last two years ESOC has put a significant effort into its Napeos processing software. This software is now capable of combined processing of SLR, DORIS, GPS, GLONASS, and GIOVE data. It is routinely used for a large number of tasks within ESOC, e.g., for IGS, ILRS, and IDS reprocessing for the ITRF2009.

During 2008 the IGS GNSS tracking network has been significantly enhanced. It now offers more than 100 multi-GNSS tracking stations with a reasonably good global coverage. In addition the GLONASS system has been enhanced thanks to two triplet launches, on September 25 and December 25, 2008. Consequently, the GLONASS system now consists out of 19 active satellites. This means that a GPS-GLONASS combined solution of the IGS GNSS network has the potential to almost double the number of observations compared to a GPS only solution.

In our presentation we will show results from our combined GNSS analysis, both the combination of GPS and GLONASS as well as the combination of GPS and GIOVE. We will address the challenges encountered when simultaneously processing the data of multiple GNSS constellations. The prime focus of our presentation will be on the the benefits of the combined GPS-GLONASS processing compared to the GPS-only processing in our IGS routine analysis.