Abstract

Among the many measurement techniques, by far the gravimetric ones provide the most accurate measurements of sea surface elevations compared to other methods. However, the relative high cost of such equipment and time required for on-site measurement makes it difficult to cover a large number of stations. For this reason, global sea-level observations are obtained using numerical models of the global ocean-ice interactions (GIOG) process. Moreover, the availability of land deformation sensors (LSN) allows for monitoring changes in the Earth's surface. This study presents a comparison of the different solutions for the vertical land movements (VLM) of the TIGA combined solution from the IGS. These solutions were compared with the ICE-6G (VM5a) GIA model, from the Permanent Service for Mean Sea Level (PSMSL) Revised sea level trend estimates for 27 tide gauges from the PSMSL Revised Sea Level Trends database, and with the TAC models.

Introduction

After the two Center Reports (1999, 2004), and the first International GNSS Service (IGS) Workshop in 1997, the IGS established the Task Group on Geodynamics (TIGA). The aim of TIGA is to provide a service for the IGS’ users by developing and providing methods and products for tracking and modeling of the Earth’s surface deformation. The TIGA is a scientific partnership between the Global Navigation Satellite Systems (GNSS), the International GPS Service (IGS), and the IGS TIGA Working Group (TIGAWG).

The main objective of the combination is to improve the accuracy of the TIGA solutions and to provide a service for the IGS’ users by developing and providing methods and products for tracking and modeling of the Earth’s surface deformation. As such, the TIGA solutions are pre-processed and checked at inconsistency levels.

Solution Combination

Table 1 shows the statistics for the velocity differences between the estimates after correction with the occupation and solutions of a) ITRF2014, b) JPL and c) NGL. The RMS difference between the two solutions is at 0.97 mm/yr. The table shows results from this comparison which was based on approximately 400 stations as not all three solutions include the same data set. The RMS value indicates the standard deviation of the mean and reflects the quality of the TIGA combined solution. The TIGA combined solution is more consistent than the individual TAC solutions. Clearly visible is the improved agreement with each other and to the combined solution, with the RMS difference between the two solutions not exceeding 1.7 mm/yr.

Table 2. Statistics for the velocity differences between the TIGA and TAC solutions from DGF and AUT.

Vertical Land Movements

Table 3. Statistics for the velocity differences between the TIGA combination and the ICE-6G (VM5a) GIA model.

Impact on MSL Trends

Table 4. Standard deviation of individual sea level change estimates using no correction, TIGA correction and ICE-6G (VM5a) GIA correction.

Conclusions

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References

