Geophysical Research Abstracts
Vol. 14, EGU2012-8337, 2012
EGU General Assembly 2012

A solution to the global height datum problem based on satellite derived global models and the corresponding error budget

R. Barzaghi (1), A. Gatti (2), M. Reguzzoni (1), and G. Venuti (2)

(1) DIIAR, Politecnico di Milano, Milano, Italy, (2) DIIAR, Politecnico di Milano - Polo territoriale di Como, Como, Italy (giovanna.venuti@polimi.it)

The global height datum problem, that is the determination of biases of different height systems at global scale, is revised and two solutions are proposed. As it is well known, biased heights enter into the computation of terrestrial gravity anomalies, which in turn are used for geoid determination. Hence, these biases enter as secondary or indirect effect also in such a geoid model. In contrast to terrestrial gravity anomalies, gravity and geoid models derived from satellite gravity missions, and in particular GRACE and GOCE, do not suffer from those inconsistencies. Thus, these models can be profitably used in estimating the existing height system biases. Two approaches have been studied. The first one compares the gravity potential coefficients in the range of degrees from 100 to 200 of an unbiased gravity field from GOCE with those of the combined model EGM2008 that in this range are affected by the height biases. The second approach compares height anomalies derived from GNSS ellipsoidal heights and biased normal heights, with anomalies derived from an anomalous potential which combines a satellite-only model up to degree 200 and a high-resolution global model above 200. Numerical tests have been devised to prove the effectiveness of the two methods, in terms of variances of the biases to be estimated. This error budget analysis depends on the observation accuracies as well as of their number and spatial distribution. The impact of the error covariance structure of the GOCE and EGM2008 models has been evaluated together with the impact of the observation network design.