MODELING TIME VARIATION OF GRAVITY GRADIENTS DUE TO WATER LEVEL FLUCTUATIONS

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The water level fluctuations of the Danube River in Budapest during the great flood in 2002 were recorded. The 3D model of the river bed allowed us to build an accurate polyhedral model of the time variation of mass changes of the flood. This mass density variation model made it possible to compute and compare time variations of various gravity field functionals. Gravity and full gravity gradient tensor changes were computed on a regular grid for the model area and these changes were compared with accuracies attainable for gravity measurements. This way we were able to evaluate which kind of gravity field parameter is more suitable for detecting gravity field variations due to near-site mass changes. Gravity changes were also compared with actual gravity field measurements made during the flood with two LCR gravimeters. We studied also the possibility of predicting gravity changes from certain combinations of measured gravity gradients where no mass variation model is available. This latter technique may be relevant in the future to support absolute gravity measurements by detecting the effect of local gravity field changes through repeated gravity gradient measurements.