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Statistical Downward Continuation in Gravity Field Modeling

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In this paper our aim is to recast the classical regularization methods as statistical inversion methods in downward continuation. The abel-poisson integral equation is employed for downward continuation in Gravity Field Modeling and Geoid Computation without applying stokes formula. This integral equation, which is a first kind Fredholm integral equation, is known as an unstable and Ill-posed problem. Solution of this Ill-posed problem requires "Regularization methods" but statistically we are not permitted to use any regularization methods for every Ill-Posed problem. In this paper we are going to show when we are statistically allowed to use the "standard tikhonov" and "generalized tikhonov" as well-known classical regularization methods for Ill-Posed problems. Firstly we have created the incremental gravitational observation which are prepared to use in tikhonov methods for the downward continuation of Gravity Field Modeling in geographical region of Iran ($43.5^{o} < \lambda < 64.5^{o}$, $23.5^{o} < \phi < 40.5^{o}$). Then the incremental observation is downward continued to reference ellipsoid to obtain the incremental gravitational potential (unknowns) and finally the unknowns are tested by a statistic which is specially designed for testing the downward continued observable quantities in tikhonov methods.