104(2009), 138 *Sitzungsberichte der Leibniz-Sozietät der Wissenschaften zu Berlin*

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The convergence problem for the collocation solution; a return

Abstract

Collocation theory is widely accepted and used in geodesy as a tool for the approximation of the gravity anomalous potential T(P) based on a finite set of observations.

As it is known, there are several interpretations leading to the same formulas, so that the same solutions can be looked upon from different view points.

Traditional is Kraup's interpretation as a stabilized solution in the sense of Tykonov and Moritz's interpretation as an optimal prediction in the framework of isotropic random fields theory.

Following his own interpretation Krarup has proved a convergence theorem which however requires that the smoothing parameter be suitably relaxed while the number of observations is tending to infinity. On the other hand Moritz has proved the point-wise convergence of the estimator to the true potential in mean quadratic sense. This however does not imply the convergence of the collocation estimator to the anomalous potential in a functional sense.

In this work the problem is faced and it is proved that if $\hat{T}_N$ is the collocation solution for N observations then there is a subsequence converging almost surely in L^2 sense to $T(P)$, under fairly general conditions on the observations.

The result can be refined depending on the properties of the covariance function of T.