

Comments on: Stopar, B., T. Ambrozic, M.Kuhar and G.Turk: GPS-Derived Geoid using artificial neural network and least squares collocation. Survey Review, Vol. 30, pp. 513-524, 2006.

The constructing of a surface representation from discrete points is a task frequently discussed in the geodetic literature. In the paper by Stopar et al. (2006) a method using so-called artificial neural networks (ANN) is proposed and applied. This method is described using a terminology which hints at something fundamental and most intelligent. However, it is in my opinion an overselling using modern meaningless buzz-words. What is done is the construction of a trend surface in an iterative manner claiming that a certain learning takes place.

A generally used method for geoid surface construction is described in textbooks like W.Torge: Geodesy, 3. Ed., 2001. The so-called remove-restore procedure is used, where a spherical harmonic model and residual topographic effects are subtracted (and later added back). The smooth resulting data set is then suitable for interpolation or extrapolation using for example least squares collocation with parameters. Please note that the resulting residual data generally will have both positive and negative values. This will also be the case for residual data resulting from the ANN procedure. Consequently the auto-covariances will at some distance become negative.

This means that equation (5) in the paper can not be used, since it is everywhere positive, see Figure 3 in the paper. In the paper this function is presented as something useful, while there exist a large literature discussing appropriate covariance functions taking into account the physical properties of the gravity field (like the fulfilment of the Laplace equation and the degree and order of the removed/restored spherical harmonic expansion).

In my opinion the ANN method should be avoided, and methods based on rigorous and correct mathematics should be employed.

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