P10-1 SOME REMARKS ABOUT SPACE AND FREQUENCY DOMAINS FILTERING ON THE POTENTIAL FIELD DATA

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Potential field anomalies are required to be recognised in terms of regional (long wavelength) and residuals (short wavelength) forms for their preparation to the interpretation process. Upward continuation, low pass filter and trend analysis applications are used in order to determine the long wavelength anomalies. Whereas downward continuation, derivatives and high pass filter methods are used to obtain the residual anomalies. Presently, these applications have been carried out in the form of space domain convolutions using coefficients as one dimension (profile data) or two dimension (map data). Because of the convolution theorem, in order to obtain the best filtering operation, the filter length should be equal to the data. However, this is not possible in the actual application. There it is inevitable to shorten the filter length during the convolution operation (Fuller, 1967). Anomaly resolutions are varied with the usage of different space domain filter lengths while the same cutoff frequencies are used for one and two-dimensional applications. However, resolutions are enhanced with the increase of filter lengths. As a result of this, the best filter length can be determined with the trial and error method. Data losses occur at the end of the space domain filtering operations. Data losses due to the convolution operation, and filter length selection criteria are out of the question for the filtering operation in the frequency domain.

The most important phenomena is determine the cutoff frequency properly during the filtering applications. Therefore, data should be scrutinized carefully in the frequency domain. Data can be transferred to the frequency domain using the Fourier Transform during the one-dimensional filter operations. On the other hand, the frequency content is very difficult to determine for the two-dimensional case and accordingly this could be done in the space domain map form. Filtering operation has been carried out using the same cutoff frequencies at the both directions. However, during the process, filtering application can be effective along one direction and but not for the other directions. This could create difficulties for analysis of data for the interpretation purposes. Also, there is a problem of computer capacity and programs for the applications of two-dimensional filtering operations. Accordingly, there would be restrictions at the map sizes and sampling intervals during the digitization of maps.

Filtering possibilities were investigated in order to reduce data losses in one and two-dimensional filtering operations, to make it possible the usage of different cutoff frequencies for two directions, and to aid to filter greater map sizes. For this purposes initially, the possibilities were searched to carry out filtering operations for one and two dimensions in the frequency domain in order to eliminate data losses. One-dimensional filtering application possibilities were investigated to overcome the difficulties due to different cutoff frequencies arising for the two dimensional case.

These studies were carried out in two stages as (i) theoretical and (ii) field applications. One and two-dimensional regional and residual anomalies of sphere and cylinder models were determined for the theoretical case. Then regional and residual separations were tried to be obtained with filtering applications using different cutoff frequencies in two directions at the space and frequency domains. The same applications were carried out to the Bouguer gravity anomaly map for the Gemlik Bay area.

Through these studies, a new approach was put forward for the two-dimensional filtering applications having various problems.

References

Fuller, B.D., 1967, Two dimensional frequency analysis and design of grid operators: Mining Geophys., 2, 658-708., Society of Exploration Geophysicists, Tulsa, Oklahoma.