3D inversion of airborne gravimetric and aeromagnetic data

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The airborne geophysical surveys generally offer several kinds of observation data, so the development of 3D inversion technique which is applicable comprehensively to several kind of data, provided a powerful tool in the data interpretation. Following this standpoint, I attemped to develop a 3D inversion scheme based on the sumulated annealing (SA) , one of stochastic optimization method. Here, we repoted the new techniques implemented to enhance reliability of the inversion results when applied to airborne grvimetric and aeromagnetic data.

In the gravity and magnetic inversion, nonuniqueness and unstability are main objects to be examined. To reduce these defficulties, a priori information must be used in the inversion scheme. A priori information can be divied into two categories, generalized and local ones. The former relates to, 1) a problem concerning the concentration of anomalies to the shallow zone, indicated the Green& #39;s third identities, 2) & #34;null space& #34; problem (existence of large homogeneous space which does not contributes to changes in observation data generates random fluctuation), 3) sensitivity problem (large differences in sensitivities exists among the variables). These problems are able to be improved considerably by implementing correction terms as a form of Tikhonov regularization. The latter information is related to 1) systematic changes of model variables, especially in the depth direction, such as compaction, 2) regional/local separation problem (signal component caused by local structure and one by regional structure must be separated correctly). The first problem is able to be resolved successfully by adjusting the search space of model parameter as a function of depth determined based on geological information. To aproach the second problem, the trade-off term is implemented into the Tikhonov regularization formulation. This method can separate regional signal component as a free surface.

SA is a algorithm with ability to be flexibly implemented a prori information as above styles, and by such implementation, stable and reliable solution can be obtained. Shallow structures around the active fault are presented as a example of application of the avove inversion scheme.