

A bad inversion result suggests bad modeling

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Bayesian inference is a powerful tool in inversion analyses of geophysical problems. In Bayesian inference, we always encounter a problem in determining the relative weight between observed data and prior information. ABIC (Akaike's Bayesian Information Criterion) gives an objective solution to this problem by maximizing the marginal likelihood for the relative weight. In principle, ABIC gives us an inverse solution that mostly follows observed data when we have enough amounts of data with good accuracy, and gives us an inverse solution that mostly follows prior information when observed data are insufficient and/or inaccurate.

In inversion analyses using ABIC, we do not manually adjust the relative weight. Hence, geophysically unrealistic results are quite easily obtained. Because of that, someone may think that inversion analyses using ABIC is difficult in dealing with or even unreliable. However, this is an excellent point of ABIC. If we obtain a geophysically unrealistic result, this implies that some problems are hidden in this analysis.

In this talk, we show some examples of the invention of inversion methods inspired by ABIC, including the discovery of the importance of modeling errors. As shown by these examples, we can get closer to the true solution not by manually adjusting the relative weight to obtain a seemingly good-looking result, but by determining the relative weight statistically. It is a harder way to determine the relative weight statistically, but we should pursue this way to understand geophysical problems more appropriately.

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