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Location error uncertainties – an advanced using of probabilistic inverse theory

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The spatial location of sources of seismic waves is one of the first tasks when transient waves from natural (uncontrolled) sources are analyzed in many branches of physics, including seismology, oceanology, to name a few. Source activity and its spatial variability in time, the geometry of recording network, the complexity and heterogeneity of wave velocity distribution are all factors influencing the performance of location algorithms and accuracy of the achieved results.
While estimating of the earthquake foci location is relatively simple a quantitative estimation of the location accuracy is really a challenging task even if the probabilistic inverse method is used because it requires knowledge of statistics of observational, modelling, and apriori uncertainties.
In this presentation we addressed this task when statistics of observational and/or modeling errors are unknown. This common situation requires introduction of apriori constraints on the likelihood (misfit) function which significantly influence the estimated errors. Based on the results of an analysis of 120 seismic events from the Rudna copper mine operating in southwestern Poland we illustrate an approach based on an analysis of Shanon's entropy calculated for the aposteriori distribution. We show that this meta-characteristic of the aposteriori distribution carries some information on uncertainties of the solution found.