PSP21

Quantifying and Understanding the Uncertainty Associated with Microseismic Frac Mapping

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SUMMARY

In this presentation we consider the causes, effects and mitigation of uncertainty in event location and interpretation. We discuss how random observational uncertainty and systematic errors can affect the event location process. We then consider how these single and joint sources of uncertainty may propagate into higher level interpretations. Through numerical experiments we demonstrate that in the case of SRV estimation the velocity model uncertainty leads to systematic scatter of estimates around the true SRV, due to distortion and translation of the seismic cloud. Whereas random observational uncertainty (ie arrival time pick and polarization) leads to an almost inevitable overestimate of SRV, due to the loss of resolution. Finally we consider what steps can be taken to reduce and quantify the affects of uncertainty within microseismic data sets when attempting higher level interpretations.

The continuing demand from end-users is to extend microseismic data interpretation beyond the basic concept of “*dots in a box*”. Enhanced analysis now frequently includes techniques such as MTI (Moment Tensor Inversion), constraining DFN (Discrete Fracture Network) models and estimating SRV (Stimulated Reservoir Volume). While this increased information can be extremely valuable it is essential to evaluate it within the context of the uncertainties associated with microseismic data and how these propagate into the higher level interpretations. This is particularly true in the case of frac mapping where data are frequently acquired in far from ideal experimental conditions.

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