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Bayesian inversion and experimental design in hydrogeothermal systems

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We present a 3-D geothermal inversion code, which is able to invert temperatures, heads and flows for thermophysical properties of the subsurface. It is based on Automatic Differentiation (forward mode) of a modeling code, and a base when constructing optimal designs for the determintation of given sets of parameters under preformulated constraints. This design bases on maximizing the trace, determinant or other properties of the Fisher information matrix, but other choices are possible and will be discussed. Both, parameter estimation (inversion) and an design optimization will be demonstrated and discussed using synthetic models.