MCMC inversion method for discontinuity detection in one-dimensional situations

Michel Menvielle*, Michel Roussignol# and Didier Chauveau#

* *Centre d'études des Environnements Terrestre et Planétaires*
4 avenue de Neptune
F-94107 Saint Maur des Fossés Cedex - France
and
Département des Sciences de la Terre
Université Paris Sud, Orsay - France
Laboratoire d'Analyse et de Mathématiques Appliquées
CNRS UMR 8050
Université de Marne la Vallée
5 boulevard Descartes, Champs sur Marne
F-77454 Marne-la-Vallée Cedex 2 - France.

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Abstract. This paper proposes a Bayesian MCMC inversion method which provides a tool to detect discontinuities in one dimensional situations. This method is developed in the case of MT inverse problem. The prior distribution is defined so that models with discontinuities are favored. The method uses a MCMC stochastic algorithm in order to compute the posterior distribution for the parameters, in particular for those describing the existence and the position of discontinuities. A MCMC convergence diagnostic based on a parallel chains approach is used. It tests the Gaussian character of the fluctuations, which is the case when convergence is achieved. Three illustrating examples are presented and discussed : two synthetic situations and an example of field data, the COPROD data set.

Keywords. Bayesian method, COPROD data set, discontinuity detection, layered media, magnetotelluric inversion, Monte Carlo Markov Chain, stochastic algorithms.