Geophysical Research Abstracts,
Vol. 10, EGU2008-A-00367, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-00367
EGU General Assembly 2008

Multivariate prior distributions using the maximum entropy principle: implementation and benefits for spatial prediction

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We discuss the problem of multivariate prior distributions in a spatial context, where the aim is to account for available information (i.e. marginal distributions, covariance functions, etc.) inside the maximum entropy (ME) formalism. To the opposite of classical method that rely on sometimes strong modelling assumptions, we show how the ME method allows us to avoid these hypotheses while at the same time providing a sound way of obtaining multivariate prior distributions that do not incorporate spurious information. By connecting the ME principle to the more general minimum divergence principle, a tractable numerical implementation of the method is presented. The benefit of using ME priors is emphasized using few examples in the context of spatial prediction. Their superiority compared to classical approaches is assessed within the recent Bayesian Maximum Entropy framework, where multivariate priors play a primary role. Though the presentation is limited to spatial prediction, the method largely encompasses other domains where rebuilding at best a whole multivariate distribution from a limited set of available information is a main issue.