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Bayesian model averaging to calibrate atmospheric specifications from infrasound signals

In infrasound propagation modeling, we often face a large number of potential atmospheric models with only a limited number of recorded signals to conduct inference from. Prediction of acoustic signals is a complex issue due to constantly changing atmospheric conditions and to the random nature of smallscale flows (turbulence, gravity waves). Thus, the uncertainty over which model to use for atmospheric specifications is an important aspect of any inference from data. In standard practice data analysts typically select a model from some class of models (G2S, ECMWF, HWM/MSISE, ...) and then proceed as if the selected model had generated the recorded signal. Such an approach ignores the uncertainty in atmospheric model selection, leading to overestimated confidence intervals. In the present work, we use Bayesian Model Averaging (BMA) as a a basis for inference about parameters of interest. The Bayesian approach offers a systematic method for checking the robustness of one's results to alternative atmospheric specifications. The method's performance is demonstrated using several events observed through the International Monitoring System (IMS). Our results demonstrate that a bayesian approach together with few atmospheric specifications can improve significantly the posterior distributions of both signal and event characteristics.

Primary author: BERTIN, Michaël (Commissariat à l'énergie atomique et aux énergies alternatives (CEA))

Presenter: BERTIN, Michaël (Commissariat à l'énergie atomique et aux énergies alternatives (CEA))

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