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Bayesian Hierarchical Model for eruption occurrence.

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The main purpose of this work is to develop a Bayesian Hierarchical Model (BHM) for eruption occurrence. The model is a formal generalization of the Time Predictable Model (TPM) in a full Bayesian framework. The Bayesian perspective allows each parameter of TPM and measurement recorded to have stochastic fluctuations. In this way, each parameter of the model is described through a probability distribution function which posterior distribution is conditioned by the available data. The numerical solution is obtained via MCMC-Gibbs sampling that has been shown to exhibit good convergence properties for all model parameters and errors. The BHM is then applied to the eruption record of Kilauea Volcano since 1923 published by the Hawaiian Volcano Observatory. We focus our attention on some specific issues: 1) to verify if the model describe the data satisfactorily; 2) to discuss the volcanological implications of the parameters obtained; 3) to compare the forecasting capability of BHM with the one of the Poisson model.