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Bayesian forecasting and time series analysis for landslides

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Bayesian forecasting is a natural product of a Bayesian approach to inference. The Bayesian approach in general requires explicit formulation of a model, and conditioning on known quantities, in order to draw inferences about unknown ones. In Bayesian forecasting, one simply takes a subset of the unknown quantities to be future values of some variables of interest(Geweke&Whitman, 2006).Rational decision making for landslides requires that the total uncertainty about a predictand (landslide state, rainfall etc) to be quantified in terms of a probability distribution, conditional on all available information and knowledge. The Bayesian Forecasting System (BFS) decomposes the total uncertainty into input uncertainty, which are quantified independently and then integrated into a predictive (Bayes) distribution. The uncertainty model takes into account the metadata (ISO19115 standards) associated with the input data, so each uncertainty model is adapted according to the metadata. The output of the model is a series of images with the spatial and temporal distribution of the landslides hazard. Specific metadata schema was created to incorporated detailed information. The study area is located in the Curvature Subcarpathians, along the Prahova River, Romania. From a geological point of view, the study area is composed from a nappe system. These nappes belong to the Cretaceous and the Paleogene flysch areas, as well as to the Upper Cretaceous and Lower Miocene post tectonic sedimentary covers. The faults, as an effect of the tectonic transformations, show a system of parallel synclines and anticlines, oriented from the East to the West (Damian, 2003). The most affected lithostratigraphic units are: Gura Beliei marls (Upper Cretaceous post tectonic sedimentary covers) which produce rotational and translational slides and earthflow; molasses deposits of Doftana (marls, clays, sandstones of Lower Miocene post tectonic sedimentary cover), affected by rotational and translational slides; Pucioasa deposits (marls, clays of Paleogene Flysch) affected by earthflows, rotational and translational slides. A detailed landslide inventory is available, which includes 156 landslides, mostly rotational slides (ca. 92%) and few translational slides (3%), complex landslides (3%) and earth flows (2%) and was correlated with a 25 years daily precipitations