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Predictive Methods and Risk Analysis

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This report focuses on predictive and risk assessment methods which can be used to model hydroclimatic extremes. This report starts with the physical basis and a brief description of the system identi[U+FB01]cation approach. Following that, several examples illustrate practical issues in temporal and spatiotemporal prediction, NARMAX and bilinear modeling. This report concerns improvement and new development of models based on data driven modelling, such as BILINEAR and NARMAX The following methods and models have been proposed: (a) dynamical-information approach to NARMAX system identi[U+FB01]cation; (b) combination of NARMAX model and Lyapunov dimension; (c) guaranteed prediction; (d) robust models; (e) risk assessment in safety analysis. The Guaranteed NARMAX Model (GNM) also provides predictions. Its main advantage is that it delivers an increased prediction reliability in comparison to earlier SRI models. A novel method of the probabilistic risk assessment of the in[U+FB02]uence of the free space environment on space systems is considered. As an example the superlight-weight thermal protection system (TPS) is considered. An approach based on combination of nonlinear dynamical models and Lyapunov dimension are used to analyze measurements of the geomagnetic indexes and solar wind parameters.