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EVA - An Interactive Online Tool for Extreme Value Analysis

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Forecasting and analysing extreme events and their impact is a duty of operational forecasters, though it happens not very frequently. In such situations forecasters often rely on a synopsis of different forecast models, own experience, historical observations and intuition. Especially historical data are usually not available at the entirety and timeliness needed in operational forecasting and warning. A forecaster needs a comprehensive overview. He has no time to dig data from a database, search for extremes and compile a rather complicated extreme value analysis on the data. On the other hand in the field of engineering expertise on extreme events is often asked from a modern weather service and in a lot of cases time for elaboration is limited.

EVA (Extreme Value Analysis) was developed at ZAMG during METEORISK, a project among alpine weather- and hydrological services dealing with meteorological and hydrological risks. The EVA system consists of two main components: An effective database containing pre-processed precipitation data (rain, snow and snow height) from meteorological events of durations from 1 minute up to 15 days measured at each station in the partner regions. The second part of the system is a set of web-tools to deal with the actual extreme value analysis. Different theoretical models can be chosen to calculate annualities. Presentation of the output is either tabular showing all extreme events at a station together with the theoretically calculated return times, or graphical where parameters like precipitation amount at certain return times and confidence intervals are plotted together with the empirical distribution of the actual measurements. Additional plots (quantile-quantile plots, empirical and fitted theoretical distribution model) allowing a more detailed assessment of the extreme value analysis can be requested. To complete analysis of a special extreme event ECMWF ERA40 sea level and upper air pressure fields and temperature distribution are available within the system.

During the years after Meteorisk, the EVA System has been expanded by ZAMG adding further parameters like wind speed and temperature. The system has lately been harmonized, so that ZAMG has now only one platform providing fast extreme value analysis for all kind of interesting meteorological parameter. A further development is the EVA-maps application. Forecasted extreme events at station locations and actual measurements are compared to historical extreme events. Return times of the forecasted and measured events are classified and displayed in a map. A mouse-over menu offers detailed analysis of the situation at each station. EVA-maps is a powerful assistance to the forecasters, where they get a comprehensive overview of forecasted precipitation in relation to extreme events of the past.