

## Event selection in CatRaRE

The German Weather Service (DWD) publishes the yearly updated dataset RADKLIM, a climatological re-processing of precipitation data from the German radar network starting on 2001-01.01. The current version contains all data from 2001 to the end of the previous year. From this dataset of hourly precipitation fields, catalogues of heavy precipitation events (Catalogue of Radar-based heavy Rainfall Events, CatRaRE) with 11 different durations (1, 2, 3, 4, 6, 9, 12, 18, 24, 48 and 72 hours) are created and further meteorological and geographical attributes are added. This document gives a brief overview on the method on event selection.

In a first step, from all precipitation grid cells those are selected that exceed a defined threshold for heavy precipitation (Figure 1). These grid cells are marked. Groups of adjacent grid cells of a minimum size depending on duration (9 km<sup>2</sup> for  $D \leq 3$  hrs, otherwise an area of the size of 3 times the duration) form so-called precipitation objects. The grid cells can have common sides or corners. This step is performed for each time step and duration individually. As threshold for heavy precipitation a duration dependent precipitation sum (here DWD's warning level 3 for severe weather, Table 1) or the return period (here precipitation that statistically occurs every 5 years) are suitable.

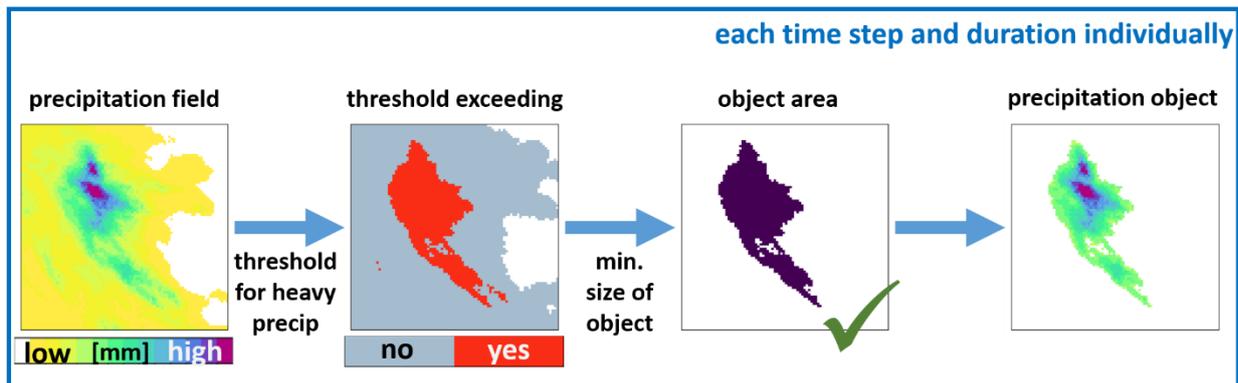


Figure 1: Scheme of detection of precipitation objects.

Table 1: Thresholds for heavy precipitation for event detection based on DWDs Warning Level 3 for severe weather. Bold values are the official warning levels for durations of 1, 6, 12, 24 and 72 hours. Thresholds for other durations are interpolated from the official warning levels.

	1 h	2 h	3 h	4 h	6 h	9 h	12 h	18 h	24 h	48 h	72 h
<b>RR [mm]</b>	25	27	29	31	35	37.5	40	45	50	60	90

In case a precipitation event exceeds the threshold for heavy rainfall for multiple consecutive time steps and/or multiple durations, it is described by more than one precipitation object. In the next step, the precipitation object that describes the rainfall event at the time step and duration of its most extreme stage is selected. From such objects, a catalogue of temporally and spatially independent precipitation events is created. Two criteria need to be fulfilled:

- **Spatial Independency:** Events should not overlap spatially in case of multiple objects with different durations at a certain time step.
- **Temporal independency:** Between two events that occur at the same location a temporal difference of at least the shorter of their durations, but a minimum of 4 hours is required (Figure 2).

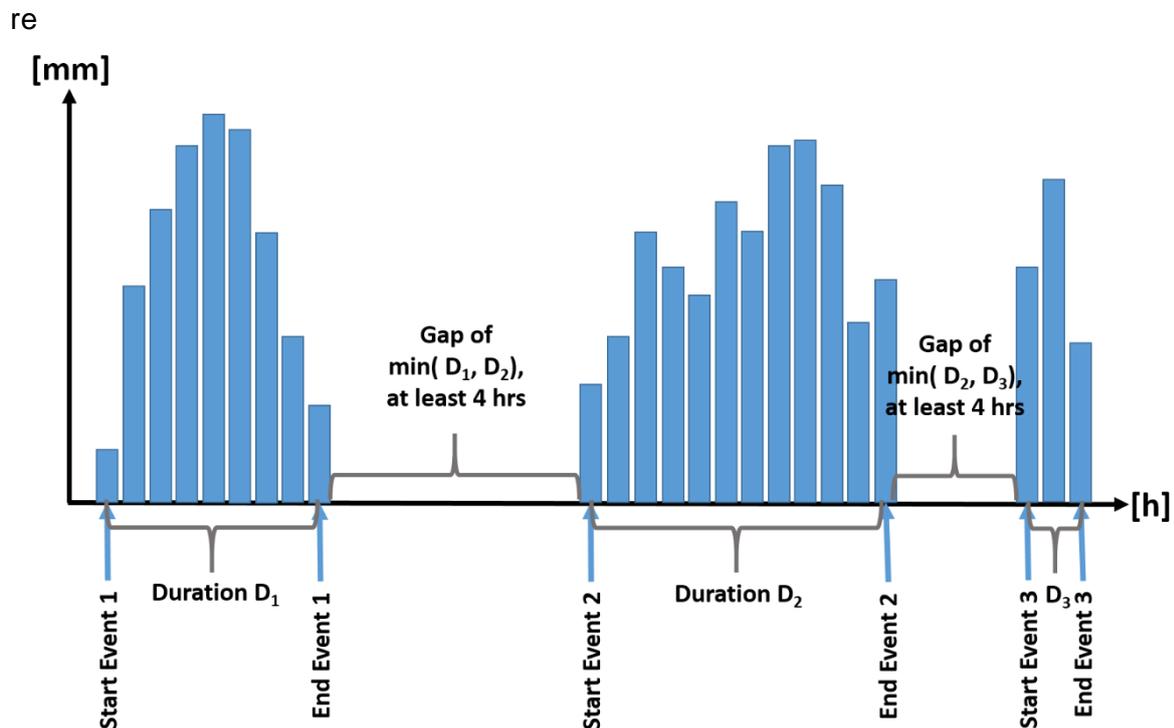


Figure 2: Scheme of the temporal independence of precipitation events.

In case of multiple temporally and/or spatially dependent objects that describe the same event, the time step and duration with the most extreme stage of the event is chosen by a defined selection criteria (Figure 3). Here, the maximum return period within the event or its extremity – a combination of return period and affected area – is used as selection criteria.

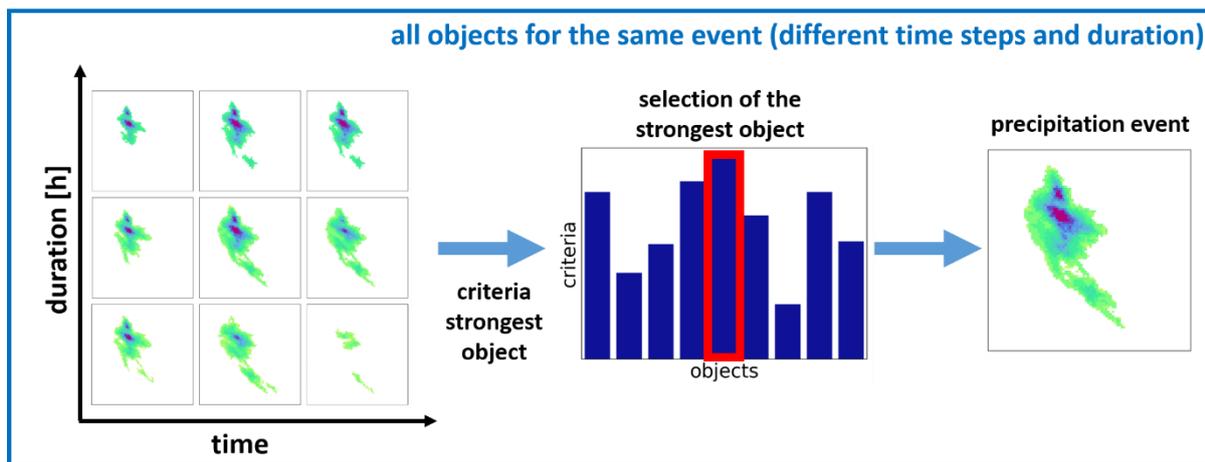


Figure 3: Scheme of the selection of temporally and spatially independent precipitation events.

In this manner, all heavy precipitation events starting with the most extreme according to the selection criteria are listed in CatRaRE. Further meteorological and geographical attributes are added in later processing steps.