

EGU2020-1525

<https://doi.org/10.5194/egusphere-egu2020-1525>

EGU General Assembly 2020

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Hydrological causes of extreme flood events and dependence on flood type

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Extreme flood events can occur due to manifold combinations of different generating factors. A differentiation into flood types helps to distinguish between the main runoff generating processes and the shape of the flood wave. However, the genesis of extreme flood events cannot always be explained by the flood type only. In a first step, flood peak and flood volume are classified to determine their extremity by a robust classification based on moments. Extreme cases of runoff generating processes like the amount of event precipitation, runoff coefficient and antecedent soil moisture are detected by their deviation from the population distribution. With this, we then analyse significant coherences between the drivers of extreme runoff generating processes and the extreme flood characteristics. It turns out, that the different flood types show very different coherences between these two factors. Moreover, many extreme peaks cannot be explained by either of these factors. Instead, the spatial and temporal distribution of precipitation plays the most important role, especially for floods caused by short and medium rain. In a second step, these two factors are included in the coherence analyses, where significant dependencies of the extremity of the flood peak on these are detected. The approach is applied to several basins in Germany and Austria, including alpine, mountainous and flatland catchments. For these, significant spatial differences in the coherences occur. In the alpine catchments e.g. the soil moisture has much more impact on the extremity of floods than for flatland catchments.