Processes involved in the formation of extreme seasons – an important research theme at the weather and climate interface

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Meteorological extremes on the seasonal time scale have received increased attention due to their relevance for society and economy. In the five-year project INTEXseas, we developed an approach to identify spatially coherent extreme season objects according to specific metrics, for instance extremely wet winters, cold winters, or hot and dry summers with an extreme seasonal-mean vapour pressure deficit (VPD). The approach has been applied to ERA5 reanalyses and large ensemble CESM climate simulations under an RCP8.5 emission scenario. This presentation will first set out the motivation for studying extreme seasons, highlight their potential impacts, and introduce our identification approach. We then sketch three illustrative examples of investigating meteorological processes involved in the formation of extreme seasons. The examples address (i) cyclone characteristics associated with extreme wet seasons, (ii) sea surface temperature anomalies potentially related to extremely cold winters downstream, and (iii) a quantitative analysis of the contributions of temperature and atmospheric moisture anomalies for very rare summer VPD extremes and their increase in a future climate. These examples should showcase the diversity of processes and impacts associated with extreme seasons, and the need for intensified research about the physical understanding of this type of high impact events at the interface of weather and climate.