The Role of Blockings for Heavy Precipitation Events in Central Europe

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Abstract

Due to its longevity, atmospheric blocking can lead to various weather extremes, reaching from heat waves and droughts in summer to cold spells in winter. While many cases of floods or heavy precipitation events are known to be associated with blockings, there is still need for research to quantify of the link to blocking, as well as to improve the process understanding.

Focusing on central Europe, we study the occurrence of flood relevant precipitation, i.e., precipitation that affects larger areas and persists for several days. These extreme precipitation events exhibit a strong seasonality that depend on the geographical location. We find that more than a third of the days with heavy precipitation are associated with a blocking. The relative location of the blocks to the precipitation events varies. While many south-western European heavy precipitation events are associated with blockings over Scandinavia, south-eastern European heavy precipitation is more affected by eastern North-Atlantic blocking.

These findings suggest, that different regions are affected by blocks through different processes. In the case of a flood event in southern Switzerland, we observe four important processes: First, the occurrence of an upstream block can lead to an elongation of a preexisting trough. This far south-reaching trough can lead to heavy precipitation at its eastern flank. Second, there can be a stalling of low pressure systems which then leads to a prolonged period of precipitation in the same geographical region. Third, due to a deviation of jet stream, recurring precipitation events can take place on the flanks of the blockings. And last, we suggest a strengthening of a downstream blocking by diabatic heating and low PV advection into the blocking.