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## First hints for the influence of planetary waves on extreme temperature events with a focus on Bavaria and the Alpine Region

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Planetary waves are global scale waves in the atmosphere, which mainly dominate the atmospheric circulation in mid latitudes. It is discussed whether planetary wave activity increases due to the decrease of the meridional temperature gradient between the equator and the pole. As a result, large-scale weather patterns in mid latitudes should change, leading to a change in the occurrence of extreme weather events.

In order to analyze whether the occurrence of extreme temperature events has already changed, an algorithm was developed that identifies extreme temperature events in ERA5 temperature data from 1979 to 2019 in different height levels (1000hPa – 1hPa). We analyze the occurrence frequency of extreme temperature events in mid latitudes of the Northern Hemisphere as well as in Bavaria and in the Alpine region. To relate changes in the occurrence of extreme temperature events to possible changes of the planetary wave activity, we use the so-called dynamic activity index (DAI), which is operationally derived from ERA reanalysis temperature data at DLR.

In the troposphere, our analyses show that the occurrence frequency of heat events increases whereas the opposite holds for cold events. This is consistent with the expected effect of increasing average temperatures on the occurrence frequency of extreme temperature events. In the stratosphere, however, we observe an increase of cold events and a constant number of heat events. We conclude that tropospheric and stratospheric driving factors for the occurrence of extreme temperature events differ. The stratospheric development can be explained by increasing planetary wave activity as it is deduced from the DAI.

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