



INFLUENCE OF PLANETARY WAVES IN THE TROPOSPHERE ON TEMPERATURE EXTREME EVENTS AT THE GROUND

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ABSTRACT

Climate change leads to latitudinally differing temperature trends in the troposphere. A changing meridional temperature gradient influences large-scale atmospheric waves, so-called planetary waves (PW), which impact large weather patterns. Examples of such are cold ground temperatures due to arctic air masses propagating South or hot air masses from the South into the mid-latitudes, causing extraordinary temperature events. Temperature extremes are a threat by itself, however, they can also lead to further risks (e.g., landslides, avalanches), especially at higher altitudes. Hence it is of particular importance to find out more about how temperature extremes develop in Alpine region.

ERA5 data of the northern hemisphere (surface level) between 1979 and 2019 is used to obtain the deviation of daily temperature values from the mean of a specific day over all years ($>2\sigma$ is counted as extreme). The result is a time-longitude matrix that can be analyzed for clusters, representing extreme events.

With a spectral analysis, the harmonic analysis, amplitude and phase of the nine largest PW numbers can be determined. This is done based on ERA5 data from 1979 until 2019 within the troposphere.

Examples of extreme temperature events between 1979 and 2019 on surface level will be identified, with the focus being on the Alpine region, and the PW governing those events will be addressed. Figure 1 shows one of the examples with an extreme event in the Alpine region on August 9th 2003. It will be discussed, to which extent the extremes in the PW at surface level are visible in PW at higher altitudes and an outlook will be provided for the future of the project.

This work is part of the WAVE Project, which received funding from the Bavarian State Ministry of the Environment and Consumer Protection under the grant number TK001KPB-73893.

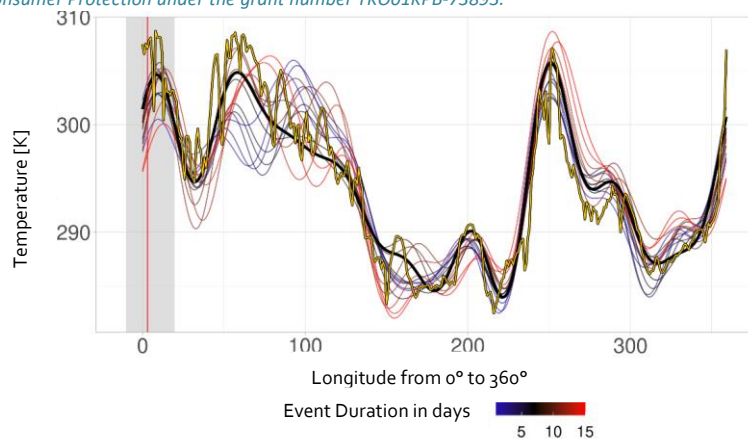


Figure 1: The gray-shaded area shows the longitudinal position of a detected heat event at August, 9th 2003 with the mostly affected longitude (red vertical line). The event lasts over 15 days. The yellow zig-zag curve depicts the temperature at 45°N at 12 UTC of the event date. During this time period, the daily temperatures which are caused by PW in the latitude area of 40°N to 50°N are marked in blue to red.

Kommentiert [HP1]: again wie was davor?

Kommentiert [HP2]: Vielleicht ein Beispiel, damit man gleich einen persönlichen Kontakt dazu hat? "for example cold ground-temperature due to arctic air masses transported southwards or warm air from Africa transported norwards to mid-latitudes."

Kommentiert [HP3]: vielleicht alternativ: of particular importance

Kommentiert [HP4]: local temperature extremes?

Kommentiert [WS5]: Wdh.

Kommentiert [FB6R5]: Wo ist wie Wiederholung? Ich finde keine.

Kommentiert [WS7]: Kannst du auch hier bitte die Änderungen aus dem anderen Abstract übernehmen?

Kommentiert [HP8]: den Teilsatz verstehen ich nicht. Sind die events in higher altitudes, oder meinst du higher altitude planetary waves (also den Einfluss von PW auf größere Höhen?)

Kommentiert [WS9]: Auf jede Abbildung, die gezeigt wird, muss auch im Text verwiesen werden. Baust du das bitte noch ein?

Sixth VAO Symposium in Grainau, 21 to 23 March, 2023



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Illustrations must appear within the designated margins. Please insert **low-resolution figures** in jpg-format.

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