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# Heavy Alpine snowfall in January 2019 connected to atmospheric blocking

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Winter weather and extreme events at mid-latitudes are determined by the atmospheric circulation variability, which is closely related to jet stream configuration and atmospheric blocking. In January 2019, record-breaking snowfall in the Northern Alps affected Austria and Germany. The event is linked to a typical weather regime of blocking over the North Atlantic and southward meridional moisture transport from the high latitudes to the Alps. This study investigates the synoptic conditions prior and during the event addressing possible forcing mechanisms for the extreme snowfall occurrence.

We analyzed the atmospheric conditions using the ERA-5 reanalysis dataset investigating geopotential height (GPH), pressure, temperature, and wind fields. For blocking detection, we applied a classical algorithm based on the reversal of mid-latitude 500 hPa GPH gradients. Evolution of surface conditions and snowfall impacts was studied based on the European daily high-resolution gridded dataset (E-OBS) and snow data provided by the Austrian weather service.

Tropospheric analysis revealed that a persistent blocking high over the North Atlantic played a major role in the meridional elongation of upper-level streams. A low-pressure system, embedded in the strongly meandering jet stream's trough, modulated the moisture flow directly towards the Alpine mountains leading to record-breaking snowfall.

Prior to the event, a major sudden stratospheric warming (SSW) took place at Northern high latitudes. We discuss the initial atmospheric conditions including SSW, blocking, and impacts on surface weather in Europe, and particularly in the Alpine region.