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Observing atmospheric blocking with GPS radio occultation – one decade of measurements

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Atmospheric blocking has received a lot of attention in recent years due to its impact on mid-latitude circulation and subsequently on weather extremes such as cold and warm spells. So far blocking studies have been based mainly on re-analysis data or model output. However, it has been shown that blocking frequency exhibits considerable inter-model spread in current climate models. Here we use one decade (2006 to 2016) of satellite-based observations from GPS radio occultation (RO) to analyze blocking in RO data building on work by Brunner et al. (2016).

Daily fields on a $2.5° \times 2.5°$ longitude-latitude grid are calculated by applying an adequate gridding strategy to the RO measurements. For blocking detection we use a standard blocking detection algorithm based on 500 hPa geopotential height (GPH) gradients. We investigate vertically resolved atmospheric variables such as GPH, temperature, and water vapor before, during, and after blocking events to increase process understanding. Moreover, utilizing the coverage of the RO data set, we investigate global blocking frequencies. The main blocking regions in the northern and southern hemisphere are identified and the (vertical) atmospheric structure linked to blocking events is compared. Finally, an inter-comparison of results from RO data to different re-analyses, such as ERA-Interim, MERRA 2, and JRA-55, is presented.

Brunner, L., A. K. Steiner, B. Scherllin-Pirscher, and M. W. Jury (2016): Exploring atmospheric blocking with GPS radio occultation observations. *Atmos. Chem. Phys.*, 16, 4593-4604, doi:10.5194/acp-16-4593-2016.