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The effect of land –atmospheric feedbacks on the intensification and propagation of the 2018 drought in Europe

Fares Al Hasan[1], Ruud J. van der Ent1[2], and Susan C. Steele□Dunne[3]
[1]Delft University of Technology, Department of Water Management, Faculty of Civil Engineering and Geociences, Delft, Netherlands.
[2]Delft University of Technology, Department of Water Management, Faculty of Civil Engineering and Geociences, Delft, Netherlands.
[3]Delft University of Technology, Department of Water Management, Faculty of Civil Engineering and Geociences, Delft, Netherlands.

The recent 2018 summer drought in Europe has been particularly extreme in terms of intensity and impact. However, how did this drought develop in time and space in such an extreme way, and what role did the change in land-atmosphere feedbacks play in the propagation and intensification of the drought in Europe.

To answer those questions, we used remote sensing products of soil moisture and NDVI to see where the 2018 drought started and how it developed over time and space. Then we used the atmospheric water vapour flow tracking method (WAM-2layers) to investigate whether the drought intensification and displacement was related to the lack of water vapour transport from the regions that first experienced the drought. To this end, we identified the anomalies in the atmospheric water vapour imports and exports within Europe during the spring, summer, and autumn seasons 2018.

Our soil moisture and NDVI analysis shows that the 2018 drought started in June in the Scandinavian countries and the British Isles and with time started to intensify and to move toward the west of Europe and after that to the southeast of Europe. The lack of land water vapour transportation from upwind regions (Scandinavian countries and British Isles) was partly responsible for the lack of re-precipitated water vapour in the downwind regions (West, South, Southeast, and East of Europe). From this study, we can conclude that extreme drought events propagate and intensify with time from upwind regions to downwind regions.