

Human land-use change impacts rainfall seasonality

Wang-Erlandsson, Lan; van der Ent, Ruud; Fetzer, I.; Keys, Patrick W.; Savenije, Huub; Gordon, L

Publication date

2017

Document Version

Final published version

Published in

Geophysical Research Abstracts (online)

Citation (APA)

Wang-Erlandsson, L., van der Ent, R., Fetzer, I., Keys, P. W., Savenije, H., & Gordon, L. (2017). Human land-use change impacts rainfall seasonality. *Geophysical Research Abstracts (online)*, 19, Article EGU2017-13008.

Important note

To cite this publication, please use the final published version (if applicable). Please check the document version above.

Copyright

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy

Please contact us and provide details if you believe this document breaches copyrights. We will remove access to the work immediately and investigate your claim.



Human land-use change impacts rainfall seasonality

Lan Wang-Erlandsson (1,2), Ruud van der Ent (3), Ingo Fetzer (1), Patrick Keys (1), Hubert Savenije (2), and Line Gordon (1)

(1) Stockholm Resilience Centre, Stockholm University, Stockholm, Sweden (lan.wang@su.se), (2) Department of Water Management, Faculty of Civil Engineering and Geosciences, Delft University of Technology, Delft, The Netherlands, (3) Department of Physical Geography, Faculty of Geosciences, Utrecht University, Utrecht, The Netherlands

Anthropogenic land-use change has profoundly changed the Earth's terrestrial water cycle. Studies of how land-use change induced modifications in terrestrial evaporation alters atmospheric moisture content and subsequent precipitation (i.e., moisture recycling) have primarily focussed on the annual mean impacts. However, the functioning of agriculture and ecosystems are often dependent on the onset, length, and magnitude of the growing season rainfall. Hence, rainfall seasonality is of crucial importance. Here, we (1) analyse how humans have altered rainfall seasonality through land-use change induced modification of moisture recycling, (2) investigate the mechanisms for the rainfall seasonality changes, and (3) discuss how downwind regions may be affected by rainfall seasonality changes. We model human land-use change effects (including irrigation) on evaporation using the global hydrological model STEAM and trace precipitation changes using the atmospheric moisture tracking scheme WAM-2layers. We find that changes in rainfall seasonality is considerably stronger than changes to mean annual precipitation, and is accentuated in locations downwind to significant land-use changes. In particular, we associate sustained rainfall season downwind with land-use types that favour transpiration. This effect is explained by the long residence time of transpiration in both the unsaturated zone and the atmosphere, in contrast to interception and soil evaporation. Our results shed light on the human influence of hydrological systems both locally and at large distances, and which may have crucial implications for agricultural production and ecosystem functioning. These insights are important in a time of both rapid land-use and climate change.