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Effects of climate variability and land use on small water reservoirs in the MENA region

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Freshwater shortages in the Middle East and North Africa (MENA) have been exacerbated with rapid population growth and changes in precipitation and drought patterns in recent decades. Agricultural production in this region relies largely on irrigation, making it vulnerable to the availability of surface and groundwater resources. Under these circumstances, small agricultural reservoirs are at the core of supporting local irrigation and livestock water demands during dry spells [1]. However, the cumulative impact of these small on-farm reservoirs on the management of limited freshwater resources in the MENA region with acute water scarcity remains unknown. We capitalize on the highly resolved satellite imagery of Sentinel 2 with 10 m resolution to identify the spatio-temporal distribution of small reservoirs ($< 0.1 \text{ km}^2$) and estimate their storage capacity in MENA. Such detailed information enables us to link the extent of reservoirs to the changes in freshwater availability and demands arising from climatic factors and agricultural activities in this region. Our preliminary results highlight correlations between the changes in cumulative area of agricultural reservoirs and variation of local precipitation and air temperature patterns. The study improves water balance and budgeting in dry regions of the world and provides insights into the impact of land cover changes on the expansion of water reservoirs supporting local irrigation demands.

Reference

[1] Aminzadeh, M., Lehmann, P., & Or, D. (2018). Evaporation suppression and energy balance of water reservoirs covered with self-assembling floating elements. *Hydrology and Earth System Sciences*, 22(7), 4015–4032. <https://doi.org/10.5194/hess-22-4015-2018>