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Predicting rootzone soil moisture with an exponential filter

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Lead author Pedro Rossini installs soil water reflectometers in a commercial field at the Flickner Innovation Farm. Photo courtesy Andres Patrignani.

Knowing the available soil moisture in the rootzone of agricultural crops is key for in-season agronomic decisions in rainfed and irrigated cropping systems. However, installing in situ sensors is often troublesome; sometimes, sensors must be removed and re-installed each growing season.

In a *Soil Science Society of America Journal* study, Kansas State University researchers collaborated with the Flickner Innovation Farm in Moundridge, KS. They used a simple exponential filter model to infer the soil water storage in the rootzone of agricultural crops from only a single sensor installed near the soil surface. An exponential filter is a simplified version of the soil water balance that propagates fluctuations in surface soil moisture in attenuated form to deeper soil layers.

The model captured daily and seasonal rootzone soil moisture dynamics. This means fluctuations in near-surface soil moisture infer what happens along the entire rootzone. This approach could be useful for estimating cropland rootzone soil moisture using a swarm of near-surface wireless soil moisture sensors, proximal sensors like cosmic-ray neutron detectors that only monitor soil moisture in the top 20–30 cm of soil, or even from remote-sensing soil moisture products, which only measure the soil's skin layer.

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Rossini, P., & Patrignani, A. (2021). Predicting rootzone soil moisture from surface observations in cropland using an exponential filter. *Soil Science Society of America Journal.* **https://doi.org/10.1002/saj2.20319**

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