Mesoscale convective systems pump local evapotranspiration moisture upward, boosting moisture recycling

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Mesoscale convective systems are organized convections typically associated with strong upward motion. Such strong vertical motion can effectively pump moisture near the land surface to the upper atmosphere and generate precipitation. Credit: Mike Newbry/Unsplash

Evapotranspiration (ET) is the movement of water from land to the atmosphere by evaporation and transpiration. Moisture recycling describes the contribution from local ET to local precipitation.

It has been quantified using models that often assume that local ET is well mixed with background moisture in the atmosphere. It is a strong assumption and may contradict reality.

To test this well-mixed atmosphere assumption, scientists used water vapor tracers incorporated in a climate model to tag moisture from local ET and trace their evolution through different processes. The research is published in the *Journal of Hydrometeorology*.

This tracer tool reveals how local ET is pumped upward by the strong updraft of MCSs, which in turn contributes to MCS precipitation, complementing our understanding of the interplay between local ET and MCS processes. It also allows scientists to understand the diurnal cycle of moisture recycling, which cannot be resolved by recycling models that assume a well-mixed atmosphere.

Focusing on May 2015, a month with more than 20 mesoscale convective systems (MCSs) occurring in the southern Great Plains, scientists found that 76% of local ET is transported away from the region, and the remaining 24% is transported upward, contributing to moisture recycling.

Scientists also found that pumping local ET is closely associated with MCSs due to its strong upward motion that can effectively pump local ET to the upper atmosphere, particularly during early phases of their life cycle.

More information: Huancui Hu et al, Moisture Recycling through Pumping by Mesoscale Convective Systems, *Journal of Hydrometeorology* (2024). DOI: 10.1175/JHM-D-23-0174.1

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