The conversion of liquid water into water vapor strongly controls the energy transfer between the Earth and the atmosphere, and plays one of the most important roles in the hydrological cycle. This process, called evapotranspiration (ET), deeply constraints the amount of green water in the total global water balance. However, assessing the ET from terrestrial ecosystems remains a key challenge in hydrology. We show that the liquid water mass losses can be directly inferred from continuous gravity measurements: as water evaporates and transpires from terrestrial ecosystems, the mass distribution varies through the system, changing its gravity field. Using continuous superconducting gravity measurements, we were able to identify a daily changes in gravity at the level of, or smaller than 10^{-10} g per day. This corresponds to 2.0 mm of water over an area of 50 ha.The strength of this method is its ability to ensure a direct, traceable and continuous monitoring of actual ET for years at the mesoscale (~50 ha) with a precision of a few tenths of mm of water. This paves the way for the development of the method in different land-use, land-cover and geological contexts, using superconducting and coming quantum gravimeters.

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