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On the representativeness of the observations: a philosophical detail or a basic paradigm?

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Observations are invaluable information for testing hypotheses, increasing knowledge and advancing science. Even if this might be universally accepted, it is however quite surprising, by looking at the scientific literature, how diverse is the terminology and the interpretation used for the same monitoring strategy, ranging from the assessment of the actual measurements to the sampling designs. While this might simply mirror the diversity of the underlying assumptions developed in the different scientific communities, it raises the question if this undermines a solid scientific foundation. Among others, in this contribution we focus the discussion on the representativeness of the observations in the soil-plant-atmosphere system. We show how this has been recognized as a relevant concept since long time. We then present some formulations that have been proposed but are still not regularly adopted. By using soil water content observations as an example, we discuss the effect of explicitly considering representativeness, and provide a way forward for adopting it as basic paradigm to advance future science.