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The contribution of Citizens' Observatories to validation of satellite-retrieved soil moisture products

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The GROW Observatory (GROW) will create a sustainable citizen platform and community to generate, share and utilise information on land, soil and water resources at a resolution hitherto not previously considered. The European Space Agency's Sentinel-1 is the first mission capable of providing high-resolution soil moisture information, but a proper validation of Sentinel data remains a challenge given the scarcity of available in situ reference measurements. Establishment of a dense network of in situ measurement can bridge the gap in spatial resolution between in situ and satellite-based soil moisture measurements enabling validation and calibration of ground and remotely measured soil moisture observations. The potential exists to answer scientific questions including the validity of satellite data, the impact of climate change on land management thus supporting the needs of growers and integrating citizen and scientific research to be more directly applicable and relevant.

The GROW Observatory (GROW) will create a sustainable citizen platform and community to generate, share and utilise information on land, soil and water resource at a resolution hitherto not previously considered. The vision is to underpin smart and sustainable custodianship of land and soil, whilst meeting the demands of food production, and to answer a long-standing challenge for remote sensing, namely the validation of soil moisture detection from satellites. GROW is contributing to a Citizens' Observatory and Citizen Science community activities across GEOSS and nextGEOSS.

As part of the Copernicus Programme, the European Space Agency's Sentinel-1 is the first mission capable of providing high-resolution soil moisture information, but a proper validation of Sentinel data remains a challenge given the scarcity of available in situ reference measurements. Establishment of a dense network of in situ measurement can bridge the gap in spatial resolution of in situ and satellite-based soil moisture measurements enabling validation between ground and remotely measured soil moisture observations.

GROW will deliver a well-defined unique data repository addressing spatial density, temporal consistency, geolocation, measurement period >3 months, complete with necessary metadata. The novelty will not only be the use of citizen observations, but also the availability of ground measurements of irrigated and tilled land, which will act as a crucial data repository facilitating calibration of empirical models, machine learning models and validation for satellite-derived soil moisture, in particular Sentinel.

This novel data repository can be used to help unlock some of the still poorly understood connections between soil moisture and other climate variables. Insights from the GROW science experiments and observations have the potential to provide useful inputs into a number of downstream applications and models such as flood risk assessment and heat wave monitoring.

GROW is building, training and equipping a community of primarily individual growers and small-scale farmers across Europe to participate in earth observation measurements, as a part of the Citizens' Observatories community activity in GEOSS. The potential exists to answer scientific questions including the validity of satellite data, the impact of climate change on land management thus supporting the needs of growers and integrating citizen and scientific research to be more directly applicable and relevant.

Offering open access to a harmonized soil database contributed by growers can lead to the use of data in many different activities. Service innovation will create concept and prototype products and services using the GROW API, GROW will be a virtual laboratory for companies, scientists and citizens, giving users insights about technology, data, and soil moisture measurements.

