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Towards an Open Digital Twin of Soil-Plant System

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Climate projections strongly suggest that the 2022 sweltering summer may be a harbinger of the future European climate. Climate extremes (e.g., droughts and heatwaves) jeopardize terrestrial ecosystem carbon sequestration and hinder EU's goal of being climate-neutral by 2050. The construction of an open digital twin of the soil-plant system helps to monitor and predict the impact of extreme events on ecosystem functioning, the resulting information from which can be used to recommend measures and policies to increase the resilience of ecosystems to climate-related challenges. There are three main components of the soil-plant digital twin: i) The soil-plant model for a digital representation of the soil-plant system; ii) Physics-aware machine learning algorithms to approximate the soil-plant model; and iii) Data assimilation framework to digest Earth Observation data to update the states of the soil-plant system. This paper will present a prototype of this open soil-plant digital twin.