Paper ID: 90279
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IAF EARTH OBSERVATION SYMPOSIUM (B1)
Interactive Presentations - IAF EARTH OBSERVATION SYMPOSIUM (IP)

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# MACHINE LEARNING APPROACHES PREDICT SOIL MOISTURE ON A SPATIAL AND TEMPORAL SCALE.

**Abstract**

Soil moisture is acknowledged as a crucial element in hydrological and climate studies. Global continuous high-resolution soil moisture records are still scarce. Accurate soil moisture data is essential for creating hydrological applications. The paper offers in-depth data on the variations in soil moisture across different regions and time periods. The development of machine learning and remote sensing technologies have made it possible to generate soil moisture products for the continents and the world at both the spatial (1 km) and temporal (daily) scales. Some products depend on several data sources for input, requiring an evaluation of their actual geographical and temporal resolutions. The assessment is complicated by the insufficient ground-based monitoring networks. This study evaluated soil moisture products at different resolutions, specifically 1 km. The main objective is to ascertain their genuine spatial and temporal resolution and accuracy. The data clearly show the constraints and possibilities of each product. The study utilized artificial intelligence systems to estimate soil moisture by using remote sensing and climatic data. The model is based on a different artificial intelligence method that blends satellite-derived land surface data (soil, vegetation, and terrain) with satellite-based soil moisture models.