

# The Earth Explorer 11 WIVERN mission: Advancing Atmospheric Science Through In-Cloud Observations of Global Winds

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WIVERN (WInd VELOCITY Radar Nephoscope), selected as the Earth Explorer 11 within the European Space Agency's Future EO programme, will be the first mission to provide global measurements of the in-cloud winds and vertical structure of cloud properties across a wide range of scales, from 1 to 1000 km. The payload of the mission consists of a dual-polarization Doppler 94 GHz cloud radar with a fast conically scanning antenna larger than 3 m that enables an 800 km swath, with a daily revisit poleward of 50° and approximately 650 m vertical resolution. The radar incorporates state-of-the-art technological features, that have been extensively proven in surface-based and airborne system studies during the mission pre-feasibility and feasibility phases. The proposed features for the WIVERN form an innovative simultaneous radar–radiometer concept, integrating range-resolved Doppler velocity, reflectivity measurements, and passive microwave observations. These unique observations will offer new insights into storm dynamics and some of the most climatically significant cloud systems, leading to improved climate models, weather forecasts, and disaster preparedness.

This presentation will provide the mission concept and current status, together with an overview of the three primary scientific objectives: 1) Understanding Storms; 2) Constraining Clouds and Precipitation Impact on Climate; and 3) Improving Numerical Weather Prediction, Earth System, and Artificial Intelligence-based Models.

The unique capabilities of WIVERN in mapping storms will be illustrated through an end to end instrument simulation for an overpass above hurricane Milton whereas WIVERN NWP impact will be demonstrated through results of an Observing System Simulation Experiment (OSSE) study conducted with the AROME model (Application of Research to Operations at Mesoscale (a high-resolution numerical weather prediction model developed by Météo-France)). The implications for cloud and precipitation product of WIVERN enhanced sampling compared to other missions deploying W-band radars (e.g. CloudSat and EarthCARE) will be discussed as well.