Letter of intent

File number 175.2021.038
Grant 2021/2022

Applicant

Title
Phased array radar for atmospheric research (PHARA)

Abstract
Relevant NWO domain: TTW&ENW
Relevant discipline codes: Electrical engineering (14.30.00); Atmospheric sciences (15.50.00); Hydrosphere sciences (15.60.00).

As the climate changes, so does our everyday weather, with an expected increase in dangerous conditions such as extreme heat, drought, heavy rainfall and thunderstorms together with heavy wind gusts, and higher river discharges. To understand, predict, and adapt to global warming we most urgently need more insight into microphysical processes going on inside clouds, which form an essential part of the climate system and into the precipitation processes taking place between the cloud base and the ground, which form an essential part of the climate system. For example, to help our rapidly expanding metropolitan areas cope with more frequent and intense rainfall events, we need improved real-time high-resolution precipitation observations for operational water management and climate-smart city planning. However, we currently lack the necessary high-resolution data covering both long timescales and large areas such as whole clouds or weather fronts for performing the required research into the topics mentioned before.

Radar techniques have the potential to drastically improve the characterization of clouds. However, traditional radar cannot separate individual microphysical processes in the atmosphere without making strong assumptions, leading to errors. Therefore, in this WI:NC proposal, we bring together an outstanding multidisciplinary consortium to create a first-of-its-kind research infrastructure for atmospheric and weather sciences: a fast-scanning transportable phased array radar with polarization diversity, that will enable to track cloud volumes and directly measure microphysical processes in them.

Realization of this technology will enable large volume coverage with a very fast update rate (more than two orders of magnitude better than conventional weather radar) at a high range and Doppler resolution providing a unique ability to analyze and predict microphysical atmospheric processes with unprecedented accuracy. For the first time, we can follow the microphysical processes in clouds at a small scale leading to breakthroughs in our understanding of the formation of the rain fall. This will improve weather forecast of extreme events.

Group of researchers involved: TU Delft (Dept. of Microelectronics and Dept. of Geoscience and Remote Sensing), TU/e (Dept. of Electrical Engineering), WUR (Dept. of Environmental Sciences), RUG (Energy and Sustainability Research Institute Groningen), ASTRON (Department of Innovation & Systems), TNO (Department of Radar Technology), KNMI (Department R&D Observations and Data Technology).

Alignment with the National Roadmap for Large-Scale Research Facilities: The requested facility is in alignment with the Ruisdael Observatory as a part of ATMOS-NL research facility (GWI) mentioned in the National Roadmap Large Scale Scientific Infrastructure 2021. The facility combines a nationwide dense network of measuring points with high-resolution (100x100 metres) simulations and the necessary computing power in order to map out changes in local weather, air quality and climate. Supplementing the facilities of the Ruisdael Observatory, the new radar will be the first of its kind with major impact on not just atmospheric sciences, but also on weather forecasting, hydrology and water management, and radar remote sensing.

Organisation responsible for the application

Confirm letter of intent
With submitting this form via ISAAC I declare to have filled in this form completely and truthfully.

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