URSI AP-RASC, Sydney, Australia, 17-22 August 2025

Radio Investigations for Space Environment Research (RISER): Progress and Plans Almost Two Years In

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The UK's NERC-funded Radio Investigations for Space Environment Research (RISER) project addresses the chain of events through which the Sun creates adverse space-weather conditions at Earth and within the Earth's space environment. RISER aims to investigate how the LOw Frequency ARray (LOFAR) can be utilised for continuous and accurate tracking of inner-heliospheric and ionospheric plasma structures, combined with magnetospheric modelling, leading to more-precise and advanced forecasts of space-weather conditions and their impacts at Earth. RISER will provide a comprehensive understanding of the Earth's space-environment through the use of novel radio observations and modelling techniques to investigate coupling between solar-driven inner-heliospheric structures and the Earth.

Space weather is a global concern, with varying impacts worldwide, regionally, and locally. RISER is, nominally, a five-year project that started on 01 September 2023 and runs to 31 August 2028. It includes partners across the UK and the USA. RISER brings together both unique radio-observing techniques and modelling, along with complementary data sets, into one, large, multi-faceted project. In essence, RISER will address many key areas of space-weather research and impacts and aims to provide improved monitoring and forecast capability at the Met Office in the UK.

In addition, the RISER project will facilitate the upgrade of the High-Band Array (HBA) of the LOFAR-UK Rawlings Array (international LOFAR station) at Chilbolton in the UK delivering the dual-beam, LOFAR For Space Weather (LOFAR4SW) capability, and a lasting legacy beyond the end of the project. Thus, this upgrade will be providing the potential for 24/7 space-weather observations towards the end of the five-year project across at least the heliospheric and ionospheric domains, and possibly some solar observations and monitoring too.

Initial tests of the LOFAR-UK station in standalone mode are already underway with automated scheduling and analyses, and it is envisaged to coordinate across other international LOFAR stations during a period of upgrades to LOFAR with the initial rollout of LOFAR2.0 hardware. RISER will be almost two years along at the time of presentation. Here we will provide an overview of the RISER project as a whole linking into the expected LOFAR4SW capabilities along with the project's high-level objectives/aims. We will report on the progress to-date throughout Years 1-2 of the project, the linkages between the heliosphere, magnetosphere, ionosphere, and space-weather impacts investigated within the project, as well as an outlook to the next steps and plans going forward with highlighted key findings thus far.