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Observations of Heliospheric Faraday Rotation (FR) and Interplanetary Scintillation (IPS): Steps Towards Investigating Bz Propagation Between the Sun and the Earth

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Space weather – analogous to terrestrial weather (describing the changing pressure, temperature, wind, and humidity conditions on Earth) – is essentially a description of the changes in velocity, density, magnetic field, high-energy particles, and radiation in the near-Earth space environment including the effects of such on the Earth. Space weather can be considered to have two main strands: (i) scientific research, and (ii) applications. The former is self-explanatory, but the latter covers operational aspects including forecasting. Understanding and forecasting space weather near the Earth is of critical importance to protecting our modern-day reliance on satellites, global-communications and navigation networks, high-altitude air travel (radiation concerns particularly on polar routes), long-distance power/oil/gas lines and piping, and for any future human exploration of space to list but a few. This includes both military and commercial considerations. Two ground-based radio-observing techniques that can add to and lead our understanding and forecasting of heliospheric space weather are those of interplanetary scintillation (IPS) and heliospheric Faraday rotation (FR). We present our latest progress using these two radio heliospheric-imaging remote-sensing techniques including the use of three-dimensional (3-D) modelling and reconstruction techniques using other, additional data as input to support and better-interpret individual case-study results.