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Galactic cosmic rays as signatures of interplanetary transients

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Coronal mass ejections (CMEs), interplanetary shocks, and corotating interaction regions (CIRs) drive heliospheric variability, causing various interplanetary as well as planetary disturbances. One of their very common in-situ signatures are short-term reductions in the galactic cosmic ray (GCR) flux (i.e. Forbush decreases), which are measured by ground-based instruments at Earth and Mars, as well as various spacecraft throughout the heliosphere (most recently by Solar Orbiter). In general, interplanetary magnetic structures interact with GCRs producing depressions in the GCR flux. Therefore, different types of interplanetary magnetic structures cause different types of Forbush decreases, allowing us to distinguish between them. With new modelling efforts, as well as observational analysis we are one step closer in utilizing GCR measurements to provide information on interplanetary transients, especially where other measurements (e.g. plasma, magnetic field) are lacking.