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Power Line Harmonic Radiation Observed by the PWING Network

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We study Power Line Harmonic Radiation (PLHR), electromagnetic emissions from ground-based power systems. In particular, we focus on how geomagnetically induced currents (GICs), driven by rapid magnetic field variations during space weather events, influence the generation and intensity of PLHR. We show that during geomagnetically disturbed periods, when GIC levels increase significantly, PLHR intensities are enhanced, most notably at even harmonics. To quantify this effect, we use high-resolution wave data from the ground-based PWING stations, combined with local magnetometer measurements to characterize GIC strength and global geomagnetic indices for comparison. The results reveal how PLHR changes with geomagnetic conditions and what factors determine its intensity. PLHR properties are examined across different locations and local times; in addition, with propagation direction analysis applied to selected cases to assess source characteristics.