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ABSTRACT ONLY

STUDY OF MAGNETIC FIELD VARIATIONS IN HIGH-CADENCE VECTOR MAGNETOGRAMS DURING SOLAR FLARES

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During a flaring event, the magnetic field topology changes rapidly, abruptly, and significantly. Some of these eruptive events inject enough energy into the photosphere and sub-photosphere to generate acoustic responses observed as sunquakes. The precise physical mechanism causing the acoustic source of a sunquake is still a topic of debate. A number of authors agree that magnetic field restructuring must play a fundamental role in causing such acoustic drivers. Previous studies have mainly probed the line-of-sight component of the magnetic field in such scenarios. In this work, we investigate the temporal and spatial evolution of the permanent changes in the magnetic field during 4 flares from high-cadence vector magnetograms (135 to 720 s) of the imaging system (dopplergrams and magnetograms) of the SDO/HMI instrument, which are suitable for investigate the phenomenon. These highly energetic events occurred during the current solar cycle 24, in a range of high and low energy, according to the GOES classification. Changes of tens of degrees in the magnetic field inclination are present in the studied flaring events displaying sunquakes. The acoustic wave is produced in the lower atmosphere by the ponderomotive force in the Alfvénic front associated with the magnetic variation. The analysis carried out represents a crucial input for the investigation of sunquake's origin and dynamics. We conclude that permanent changes in the magnetic field with values greater than 10 degrees in a kernel, are likely to induce sunquake signatures. Injection of particles seems not to take place when the field lines do not display the correct direction (downwards). Our results are in agreement with previous theoretical approaches. Sunquakes offer and opportunity for studying the interaction of acoustic waves with magnetic fields and flows in flaring active regions.

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