An automatic wave detection algorithm applied to Pc1 pulsations

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Abstract

A new technique designed to automatically identify and characterize waves in three-axis data is presented, which can be applied in a variety of settings, including triaxial ground-magnetometer data or satellite wave data (particularly when transformed to a field-aligned coordinate system). This technique is demonstrated on a single Pc1 event recorded on a triaxial search coil magnetometer in Parkfield, California $(35.945°, -120.542°)$, and then applied to a 6-month period between 1 June 2003 and 31 December 2003. The technique begins with the creation of a standard dynamic spectrogram and consists of three steps: (1) for every column of the spectrogram (which represents the spectral content of a short period in the time series), spectral peaks are identified whose power content significantly exceeds the ambient noise; (2) the series of spectral peaks from step 1 are grouped into continuous blocks representing discrete wave events using a "spectral-overlap" criterion; and (3) for each identified event, wave parameters (e.g., wave normal angles, polarization ratio) are calculated which can be used to check the continuity of individual identified wave events or to further filter wave events (e.g., by polarization ratio).

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