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Toward a Joint Array and Polarization Processing from IMS 3-Component Stations and Arrays: Seismic Wavefield Polarization and Its Spatial Coherency

Seismic waves are characterized not only by their propagation properties (i.e. velocity and direction of propagation) but also by the local particle motion trajectories they generate. These particle motion trajectories are the polarization properties of the waves and play a large part in identifying and extracting the seismic phases. To study the polarization, 3-component data are required. Most of the IMS seismic arrays contain one station co-located with a 3-C station, which offer the possibility to combine both propagation and polarization analysis. This work focuses on polarization analysis which remains underused on seismic waves study. A review of the existing 3-components array processing methods reveals that these methods are complex and limited in their use. Therefore, two alternative methods that associate array processing and polarization are suggested. In order to best exploit the polarization analyses, a standardized parametrization system describing the polarization is developed and associated with a visualization solution regrouping all the parameters necessary for the interpretation on one figure. In addition, a polarization analysis performed on data from the fully 3-component seismic broadband array of the Low Noise Underground Laboratory (LSBB), France, demonstrates the possibility to use spatial coherency to assist with the interpretation of seismograms.

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