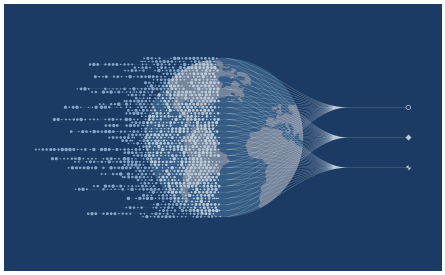

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Seismic Array Processing Using Kurtosis: A Case Study from the Grane Oilfield

Seismic arrays are known for their superior detection capabilities compared to single sensors. Array processing techniques, such as FK analysis, can estimate slowness and back azimuth, improving earthquake location estimates. However, these techniques require signal coherence across the array. Factors such as geological conditions and sensor spacing can lead to signal incoherence. Several studies suggest that characteristic functions, such as STA/LTA or envelopes, can enhance signal coherence, making it possible to perform FK analysis. In this study, we test an alternative characteristic function for incoherent array processing: the kurtosis function. This methodology was developed using a seismic network deployed on the seabed at the Grane Oilfield, offshore Norway. The dataset consists of 10 sensors with significant spacing, which contributes to signal incoherence. Despite this challenge, the recursive kurtosis function enabled the estimation of slowness and back azimuth for 8 out of 10 tested events. Integrating these array parameters into earthquake location estimates revealed notable shifts in event positions. The method developed in this study has potential applications for IMS arrays, where signal coherence presents a significant challenge. For instance, it could be applied to arrays such as MJAR in Japan, which faces incoherent signals due to complex subsurface geology.

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