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T-waves Propagation Modeling with High Performance Computing

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T waves signals at International Monitoring System hydrophone stations can present complex arrival characteristics caused by bathymetric features along their long range propagation paths through horizontal reflection, refraction, and diffraction. Thus, the interpretation of recorded T waves can be challenging due to differences in observed and expected arrival times, back-azimuths, or energy intensity. This work presents and discusses the use of high performance computing to simulate T wave propagation using a 3-D broadband Parabolic Equation (PE) model. A GPU, a single core embarrassingly parallel, and a multi-core version of the 3-DPE model are applied to simulate a T wave spectrum represented by up to 1200 frequencies ranging from 1 to 30 Hz. Single frequency model results are then synthesized to construct time series solutions. Finally, modeled results are compared with data recorded at the CTBT-IMS hydrophone station HA10 in Ascension Islands (Atlantic Ocean) for some specific events. A good agreement between modeled and observations is found for the arrival time and back-azimuth of the direct and reflected acoustic paths. Overall, results highlight the importance of accelerated computing to understand 3-D effects on T waves propagating in the ocean, which cannot be computed in reasonable times using traditional computing technics.

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Promotional text

This presentation will show how the use of high performance computing can help the understanding of long range underwater sound propagation in the ocean using 3-D models.

Oral preference format

in-person

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