Geoscience and the Changing Climate

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Current studies indicate that the global climate change is responsible for the changing weather patterns. Out of many, two important parameters which control these changing patterns are the temperature and salinity of the oceans. Oceanic temperature and salinity are measured at sparse locations within the oceans and the climate prediction models developed using such sparse data can be questionable. Seismic reflection data within the water-columns show visible reflections, which are primarily controlled by the subtle sound-speed variations within the water-columns. These sound-speed variations, in turn, are functions of the temperature and salinity. Consequently, estimating detailed sound-speed from marine seismic data and relating them to temperature and salinity have been attempted in the past. Because these seismically derived properties are of much higher lateral resolution than the sparse measurements, they can be potentially used for weather prediction. Estimating detailed sound-speed profiles from seismic reflections, however, needs iterative seismic inversion methods, which require a good initial model. Currently practiced methods to generate this initial model requires estimating detailed sound-speed profiles at sparse locations over the entire data volume and then interpolating them over the horizons, interpreted from the stacked seismic data. This process of generating the initial model is not only computationally challenging but also labor intensive. In addition, interpolating the models estimated at sparse locations via interpreted horizons is subject to human error and bias. Consequently, applying seismic inversion for weather-related studies on a routine basis is difficult. This presentation will show an automated attribute-guided interpolation to generate the initial model which is neither computational and labor intensive nor it is subject to any human error and bias. Furthermore, a deep learning strategy for estimating sound-speed and relating it to the temperature and salinity will be briefly outlined.