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The Application of Short–Time Fourier Transform and Discrete Fourier Transform in Mapping Stratigraphic Features in Tmb Field, Niger Delta

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This research focuses on mapping hidden stratigraphic features on a 3D seismic data with approaches better than direct/commercial approach. Materials used in this research are seismic data, well logs, checkshot and base map of the study area. The approach used is the Short Time Fourier Transform (STFT) programmed into MATLAB and Suffer-8 Software and algorithm used is based on Fast Fourier Transform (FFT). A reservoir window/sand interval identified on well logs in depth were converted to time (frequency) using checkshot at 4ms decomposed with STFT and Discrete Fourier Transform (DFT). Results showed sand interval extracted in time and seismic amplitude sliced at 4 ms and 10 slices obtained – a time slice before the top sand interval (2.440 sec) and below the base sand interval (2.468 sec). The original seismic magnitude and phase plotted for the top sand top (2.440 sec) was transformed using the DFT and STFT which determined the domain frequency in terms of seismic attributes, magnitude and frequency. Identified lithologies in the studied section across the wells are sand, sandy shale and shale. A subtle stratigraphic feature – Channels has been identified. The time slice interval of 2.436 – 2.472 sec, showed variations in amplitude properties with depth suggesting changes in formation fluid and sequence boundary. Resolving hidden stratigraphic features on seismic data require high frequency enabled tuning and has been achieved with the STFT and DFT. Frequency maps (slices), the reservoir window identified with the STFT approach gave localized stratigraphic feature, better results compared with DFT and time domain.

Keywords: Short Time Fourier Transform, Discrete Fourier Transform and Hidden stratigraphic features

Biography:

Dr. Ideozu is a geoscientist, goal oriented, team player, excellent interpersonal relationship, dedicated, committed to work. His academic training was at the University of Port Harcourt and obtained B.Sc. Geology, M.Sc. Petroleum Geology / Exploration Geophysics and Ph.D Petroleum Geology and his Area of specialization are Petroleum Geology / Sedimentology and Reservoir Geology. His Core specialties are Sedimentology - Core and outcrop studies including Fluvial, deltaic, deep-water depositional settings and Reservoir modelling. Research interests are biostratigraphy (Micropaleontology & Palynology), petroleum geochemistry, clay mineralogy, structural geology, Exploration Geophysics and Mineral Exploration. Dr. Ideozu has eight years of Teaching and Research Experience and 13 years Professional Experience.