Gas clouds/chimneys from seismic data using artificial neural network

We have developed a workflow based on neural network for the computation of new attribute(s) from a set of other seismic attributes that can discriminate geologic features from gas clouds or chimneys. Application to time migrated 3D seismic data in the Maari field of highly structured and deformed Taranaki basin of New Zealand has brought out clear gas clouds that have originated from the Late Cretaceous source rocks (Pakawau Group) and migrated into the Eocene (Kapuni Group) and Miocene (Mahakatini Group) formations (Fig.1). The study also reveals that gas has seeped through the overlying Pliocene to recent formations, the imprints of which are observed as pockmarks on the seabed. The findings correlate reasonably with the results from Moki-1 well in the study region. This workflow can be used for interpreting plausible geological features such as faults, mud diapirs, mud volcanoes, salt bodies, slum deposits, debris flows etc. from seismic data. Several fault intersection zones (weak zones) within the reservoirs exhibit high probability of gas chimneys. This study acts as an add-on-tool for understanding the petroleum system and provides preventive clues for mitigating hazards in future exploitation program. The technique can be extended in characterizing reservoir properties such as the porosity, permeability, saturation etc.

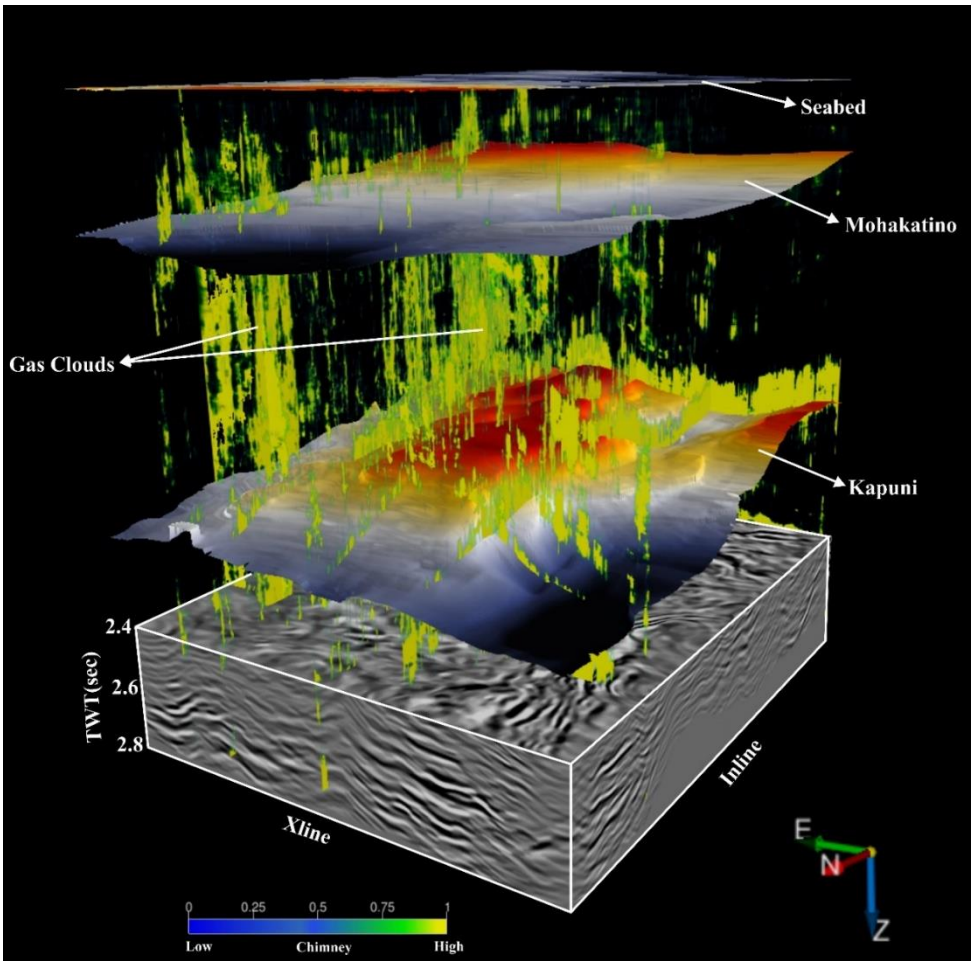

Fig.1: 3D visualization of gas clouds rising from thermally matured source rock and propagating through Eocene and Miocene sandstone reservoirs to the seabed.

For further details: Deepak Singh, Priyadarshi Chinmoy Kumar, Kalachand Sain, Journal of Natural Gas Science and Engineering 36 (2016) 339e357, http://dx.doi.org/10.1016/j.jngse.2016.10.039