GAS HYDRATES SATURATION ESTIMATION USING GEOPHYSICAL METHODS: AN APPLICATION TO KRISHNA-GODAVARI BASIN, INDIA

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ABSTRACT

Gas hydrates are an unconventional energy resource. They may become an important possible source of energy for India and some other countries in the future energy scenario. Although a technology for economic production of gas hydrates does not currently exist, much effort is being made to explore and quantify gas hydrate saturation. The goal of this work is to present a new technique to estimate the quantity and location of gas hydrates. The region of study for the project is the Krishna-Godavari basin located on the eastern offshore of India. A 2D seismic line and well data were used for the study. The method to estimate gas hydrates saturation uses a combination of seismic inversion and seismic attributes. This includes stacked and migrated data along with well logs to perform poststack seismic inversion to obtain impedance volumes. These volumes were combined with multi-attribute analysis using a neural network method to predict anisotropic resistivity and porosity logs at the well location. Transform equations relating the seismic attributes to the well measurements predicted the petrophysical properties throughout the desired zone of interest. By using neural networks for multi-attribute analysis a statistical method for the prediction gas hydrates saturation along the complete seismic profile was obtained. The results suggest gas hydrates saturation in the range of 50–80% in the region. The estimated saturation of gas hydrates matches up very closely with the saturation readings obtained from the cores recovered during coring. Hence, the method provides a very accurate method of quantification of gas hydrates by making use of seismic and well log data.

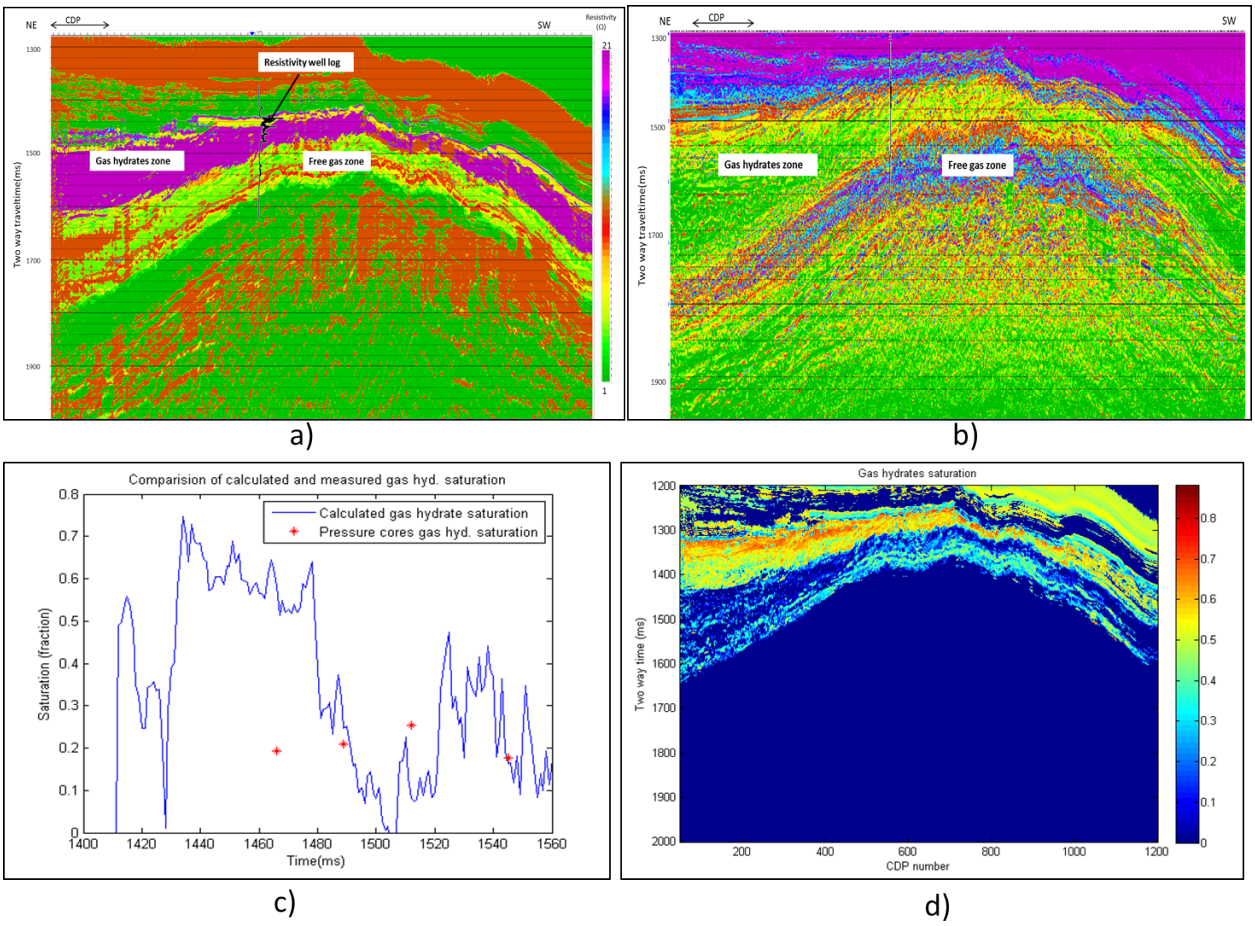

Figure a) shows the predicted resistivity and figure b) shows the predicted porosity along the 2D seismic profile. Figure c) shows the estimated gas hydrates saturation at the well using the predicted logs from figure a and figure b. The red dots are the saturation obtained from cores. The predicted saturation pseudo log matches three of the observation data points. Figure d) shows the gas hydrates saturation estimation along the seismic profile.