Characterization of the dolomite reservoirs with the help of photoelectric index volume

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Carbonate sedimentary rocks that have been fractured, or dolomitized and laterally sealed by tight undolomitized limestone, are frequently seen to produce hydrocarbons. However, the differentiation between limestones and dolomites is a challenge. The purpose of this work is to describe a workflow for discriminating limestones and dolomites, and to map the lateral extent of dolomite reservoir rocks that have a thickness below the seismic resolution.

For this study, we have used the photoelectric index (Pe) well log curve as it is a sensitive indicator of mineralogy. At any well location, Pe exhibits somewhat higher, but flat trend for background limestone. Relative to this flat trend the dolomite units are represented by low values of Pe. However, such well log curves are available only at the location of the wells. We demonstrate an approach of computing Pe volume from the seismic P- and S-impedance volumes. We begin our exercise by crossplotting the P-impedance (I_P) against the S-impedance (I_S) color coded with Pe curve using the well log data. In I_P-I_S crossplot space, we highlight the discrimination between the limestone and dolomite clusters by choosing an axis of rotation to highlight the desired discrimination. The result of such a rotation is a single display attribute we call lithology impedance (*LI*) to identify the formation lithology. Furthermore, its relationship with the Pe curve is established for obtaining Pe volume from the seismic data. The issue of the resolution of the seismic data is addressed by using a thinbed reflectivity inversion.