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Tracing of Nature of Reflections of Stratal Surfaces by Seismic Modeling of Outcrops: Sego Sandstones of Eastern Utah, USA

Stratal surfaces (chronostratigraphic surfaces) are believed to generate primary seismic reflections, and thus have been previously used as impedance boundaries in seismic modeling. These models created sharp impedance boundaries that corresponded with what were interpreted as key chronostratigraphic stratal surfaces. The models created in this study show that seismic reflectors more closely follow facies boundaries as long as there is enough impedance contrast between the overlying and underlying strata. In the produced seismic profiles, the facies are distributed as they were deterministically measured in outcrop. Facies, petrophysical property distributions, and stratal geometry play an important role in the generation of seismic reflection. Chronostratigraphically significant stratal surfaces with no impedance contrast are a direct control on nothing. However, these surfaces may or may not mark boundaries between facies which have different impedance properties (i.e. impedance facies). Some chronostratigraphically significant surfaces show no difference in impedance facies across their surface and thus are not marked by a seismic reflection. In other instances the impedance facies contrasts across key surfaces may be sharp. Such contrast in impedance can also occur across a boundary in the absence of any obvious lithology change, such as a cross-contact relationship between two shales with very different impedance values. Nevertheless, the apparent reflection of a "key surface" in seismic data is at the mercy of the rocks juxtaposed across the surface.