

Seismic Stratigraphic Framework For Upper Cretaceous Strata In The National Petroleum Reserve Of Alaska (NPR-A).

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ABSTRACT

This paper presents the results of a study conducted in 2003 over the upper Cretaceous strata in the National Petroleum Reserve of Alaska (NPR-A), with the objective of defining a seismic stratigraphic framework which would facilitate the recognition of sediment depositional timing and transport directions within the basin, and to propose a model of evolution of the upper Cretaceous strata.

Because of the potential for new reserves, and the lack of published, detailed seismic stratigraphic analysis, it was believed that a study such as the one conducted could be very valuable for oil and gas exploration.

The research procedure involved utilizing 2D seismic data covering 23,200mi², which represents 129 lines measuring approximately 15,000 miles, and 8 wells (Tunalik, Kugrua, South Meade, Topagoruk, Ikpikpuk, Inigok, North Inigok, and North Kalikpik). For every well a time-depth curve was created to tie well and seismic interpretations.

On the basis of good areal reflection continuity, 54 mappable seismic horizons were recognized. These horizons were correlated with the well logs. Between every two surfaces, isochron thickness maps were created to define shelf breaks for each interpreted interval. A shelf-break map was then used to determine depositional patterns.

The upper Cretaceous basin deepened in a west to east direction during deposition of a series of progradational and aggradational wedges, which were the products of very high sediment influx. The basin is divided into two areas, the western and eastern NPR-A, due to differences in the depositional patterns. Deposition in the western NPR-A is related to greater accommodation space with a N61°E transport direction, while deposition in the eastern NPRA is related to reduced accommodation space and transport in a N81°E direction. This is a result of compensation deposition on a large scale.

Because the biostratigraphy in this area is not reliable, a methodology was proposed to date the mapped wedges. This methodology is based on the principle that thickness of the Lowstand Systems Tract (LST) would tend to be greater than that of the Transgressive Systems Tract (TST) and Highstand Systems Tract (HST) deposits. This methodology proposed sediment deposition during the period between the Aptian (112.4 my) and the Cenomanian (93.1 my).

The 54 surfaces interpreted were used to aid the sequence stratigraphic analysis from well log correlation, and resulted in the interpretation of a seismic sequence stratigraphic framework along three regional 2D seismic lines in west-east, north-south, and northwest-southeast directions. The sequence stratigraphic framework resulted in the identification of 26 – 3rd order cycles which were deposited over approximately 19.3 million years. In addition, the study confirmed that this region could be attractive for oil and gas exploration.