Stratigraphic Architecture of Non-channelized (Lobe) Strata in a Submarine Fan Setting, Cretaceous Point Loma Formation, California

Fleming, Alexandra E.[1]; Pyles, David [1]; Anderson, Donna A.[2]; Sullivan, Morgan D.[3]; Trudgill, Bruce [2] (1) Chevron Center of Research Excellence, Department of Geology and Geological Engineering, Colorado School of Mines, Golden, CO. (2) Department of Geology and Geological Engineering, Colorado School of Mines, Golden, CO. (3) Chevron Energy Technology Company, Houston, TX.

Submarine fans are pervasive features on the modern and ancient seafloor, but few detailed analyses exist for non-channelized submarine fan deposits. Studies on modern fans have used near-seafloor images and seismic data to determine large-scale architecture, however, the data resolution often does not resolve smaller-scale features such as grain size, sedimentary structures, and facies. In contrast, outcrop studies offer the ability to describe these details. The Point Loma Formation in Southern California is a world-class, strike-oriented outcrop that offers the opportunity to better understand the internal architecture and facies distribution of non-channelized submarine strata in a submarine fan system. This study uses detailed photopanels, stratigraphic columns, and thin sections to interpret seven kilometers of continuous outcrop.

A detailed cross-section running nearly perpendicular to paleoflow illustrates a broadly coarsening upward succession of non-channelized strata. The three main architectural elements in this system are lobes, mass-transport complexes, and mudstone sheets. Lobe architecture is of particular interest because of its direct analog to some reservoirs in the deep Gulf of Mexico. In this study, the highest net:gross (0.95) lobes are found in the upper strata where grain-size ranges from silt to coarse-sand. The lowest net:gross (0.1-0.5) lobes are found in the lower strata where grain-size ranges from silt to fine-sand. Lobe aspect ratios (width:height) are approximately 2200:1, where the axes of high net:gross lobes are about 2 meters thick. As lobes thin to their margin, they become finer grained and de-amalgamate into vertically discontinuous sand beds and then entirely into siltstone. Megaflutes are rare but occasionally occur in the lower part of the lobe axis with maximum erosion of 90 centimeters.

The results of this study can be used to refine interpretations of subsurface data in non-channelized submarine fan settings. The connectivity between lobes, element aspect ratios, facies distribution, and grain-size distribution described in this study will aid in the characterization of reservoirs in analogous submarine fan strata.