Subsurface and Outcrop Toe-of-Slope Carbonate-Siliciclastic Transition, Bell Canyon Formation (Guadalupian, Permian) Southeast New Mexico

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9.29.2020 - 10.1.2020 – AAPG Annual Convention and Exhibition 2020, Online/Virtual

Abstract

The Bell Canyon Formation basin siliciclastics grade into the age-equivalent Capitan Formation carbonate shelf margin on outcrop in the southern Guadalupe Mountains. The seven named Bell Canyon members in the Guadalupe Mountains (except the Lamar Limestone) contain a significant fraction of interbedded siliciclastics, even close to the shelf margin. Carbonate beds within the members have variable thicknesses and in some cases, limited strike and dip distribution. This has resulted in correlation problems on outcrop and confusion about processes driving toe-of-slope sedimentation along the Capitan margin. Well logs were analyzed to evaluate the distribution, continuity, and lithology of the Bell Canyon members along the subsurface Capitan lower slope-to-basin transition on the northwestern margin of the Delaware basin. Most named outcrop Bell Canyon members cannot be traced into subsurface by carbonate content due to their lithological heterogeneity. However, some unnamed siliciclastic units between and within the named members are continuous along the NW margin of the Delaware basin and far into the basin. These include siltstones interbedded with the Hegler Member, a siliciclastic unit within the Pinery Member, and the thick siliciclastic units between the Pinery, Rader, McCombs, McKittrick, and Lamar members. These units are also present (but poorly exposed) on outcrop. They can be used to identify the subsurface equivalents of named members. Subsurface named members also have variable siliciclastic content and carbonate bed

thicknesses near the toe of slope. Both correlative siliciclastic units and siliciclastic equivalents of the named members can be traced beyond pinchout of carbonate beds to the basin center.The distribution of carbonates and siliciclastics is consistent with a combination of allogenic and autogenic controls. Autogenic processes are responsible for lateral changes in thickness and distribution of individual carbonate beds. Interbedding of siliciclastics and carbonates within named members reflects high frequency allogenic control as suggested by Borer and Harris (1991) for Yates shelf deposition. Lower frequency events are identified from correlative condensed intervals. Some condensed intervals correlate to positions near the named members, implying that siliciclastic supply to the deep basin is controlled by sea level.