Strike Variability and Cyclicity of Upper Devonian (Famennian) Foreslopes, Canning Basin, Northwest Australia

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Carbonate foreslope systems are primarily constructed by sediment gravity flow architectural elements that have distinct angles of repose and compositions. Among these are coarse debris deposits (megabreccias) that result from gravitational collapse of early-lithified, high-angle carbonate reef margins. Strike variability and cyclic vertical successions of foreslope elements are observed from Upper Devonian (Famennian) outcrops of the Canning Basin, northwest Australia.

Thirty measured sections tied to detailed photomosaics were collected for over 5 km2 and 200 m of seismic-scale early to mid Famennian foreselope strata (374.5 to ~ 365 mybp). The outcrops highlight the strike variability associated with collapse events, such as platform margin rugosity (depositional promontories and collapse-related reentrants) and differential topography on the slope produced by mounded megabreccia complexes. Foreslope elements are arranged in correlative, predictable vertical successions, consisting of 1) reef collapse megabreccias, 2) condensed intervals indicating slope starvation, and 3) platform-derived breccias and grainstones.

Famennian foreslope outcrops in the Canning Basin emphasize the importance of recognizing the component architectural elements of carbonate slopes and appreciating their strike variability. Megabreccia deposits on the slope indicate updip margin collapse, and their occurrence within cyclic vertical successions offers constraints for collapse timing. The strike-discontinuous products of collapse (reentrants and mounded megabreccias) provide sediment focal points that promote slope channelization, and subsequently affect slope-to-basin reservoir development. Thus, megabreccia presence, their occurrence within vertical successions, and their strike relationships with other foreslope deposits can offer predictive capability for deep-water carbonate systems and potential channelized reservoir accumulations.