

Evidence for Forced Regression in the Santonian-Campanian Eagle Formation in South-Central Montana

Jörn Hauer¹, Oliver Oswald², Marc S. Hendrix¹, James R. Staub¹, and David E. Jarvis³

¹Department of Geosciences, The University of Montana, Missoula, MT.

²Institut für Geowissenschaften, Universität Potsdam, Potsdam, Germany.

³Geology Department, University College Cork, Cork, Ireland.

An integrated lab- and field-based sequence stratigraphic study has been conducted on paralic to shallow marine clastic sediments of the ~70 m thick Eagle Formation in south-central Montana. The Eagle Formation, a sandstone deposited during Santonian-Campanian time along the western shore of the Cretaceous Interior Seaway, was studied on continuous cliff exposures along an 85 km long west-to-east transect down depositional dip and a 45 km long north-to-south transect parallel to depositional strike. Sedimentologic data and results from high-resolution GPS mapping of sequence stratigraphic surfaces were integrated with observations from continuous core and well log data to extend the sequence stratigraphic model into the subsurface. Overall, the Eagle Formation consists of two depositional sequences with parasequences that thin and shale out to the east. The lower part of the Eagle Formation comprises five stacked sandstone wedges, each ~10 m thick. The lowermost sandstone is characterized by tabular dm-scale fining-upward beds interpreted as sediment gravity flows. Truncated by a wave-ravinement surface, the five sandstone wedges are overlain by ~12 m of bioturbated glauconitic sandstone and ~7 m of transgressive lower/middle shoreface silty shale interstratified with HCS sandstone. These deposits are sharply overlain by ~8 m thick swaly to trough-cross stratified upper/middle shoreface sandstone. The sharp contact can be mapped regionally and is interpreted as a regressive surface of marine erosion. Consequently, the swaly to trough-cross stratified sandstones represent a falling-stage systems tract (FSST) and indicate a forced regression. The FSST is overlain by a lowstand systems tract (LST) characterized by ~6 m of trough-cross-stratified tidal to paralic sandstones, which are locally channelized and incised up to 5 m into the underlying FSST. The erosive basal surface of the LST marks the sequence boundary. The top of the LST is marked by a rooted paleosol and a thin coal layer, in turn overlain by heavily bioturbated glauconitic muddy sandstones, which are interpreted to represent the transgressive systems tract of the second sequence. Biostratigraphic results from palynology indicate that deposition of the Eagle Formation was initiated in the late Santonian, in contrast to recent publications suggesting that deposition started in early Campanian.