

Petrographic Comparison and Contrast of 290–Million-Year-Old Fluvial and Deltaic

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Abstract: Microscopic petrography of fluvial and deltaic sandstones in the Oread Cyclothem, NE Oklahoma, links their characteristics to depositional environments. Texture and composition of 50 framework grains in each sandstone thin-section were used to calculate the mean, standard deviation, and skewness of grain size. Two fluvial sandstones are quartz arenites and contain minor rock fragments and no matrix, indicating super compositional maturity. The grains are fine, well sorted, rounded, and fine skewed (i.e. with excess finer grains), indicating super textural maturity. The supermaturities indicate that both arenites are recycled. The lower arenite in the basal channel fill is coarser, better sorted, less skewed, but less rounded than the upper arenite in the overlying point-bar deposit. The former was deposited near channel thalweg with higher energy; and its poor roundedness is caused by abundance of rock fragments. Four deltaic arenites in the Heebner and Elgin deltas are similar to the fluvial arenites in composition and texture, indicating the same source area. The medium-grained arenite in the upper Heebner is coarser than the fine-grained arenite in the lower Heebner, probably caused by deltaic progradation. The lower Elgin arenite contains slightly coarser grains than the upper arenite, probably caused by stronger wave reworking, as indicated by field evidence. Overall, both deltas are petrographically similar, although the Heebner was influenced by upwelling currents during sea-level high whereas the Elgin was wave-dominated during sea-level fall. This suggests that sedimentary processes controlling delta formation overwhelmed other processes. Last, the differences between the supermature deltaic and fluvial arenites are that the former contain less rock fragments and are more rounded, as a result of wave reworking and longer transport.

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