Objectives

Investigate geochemical differences between two lithologically similar black shales. Literature suggests that: TOM measurements, Al, Ti, U, and V concentrations will be higher in the lower shale member. Cerium anomalies (Ce/Ce*) will be negative in the lower shale whereas the upper will have positive anomalies.

Methods

Samples were collected during summer of 2015.

There were four outcrops, one of the upper member pictured left and one of the lower member pictured right. 12 samples were collected from the upper and 4 collected from the lower.

TOM was measured using loss on ignition -- dry sediment percentages of weight loss from heating. Each sample underwent at least two trials of heating at 350º Celsius for 16 hours. Tested difference in measurement within members using Mann-Whitney.

Trace metal concentrations tested using ICP-MS. Mann-Whitney used for comparison of concentrations for each member.

Cerium anomaly calculated using log Ce/Ce*. Anomaly <1 is considered negative, anomaly >1 is considered positive.

Conclusions

The lower shale did not have a higher amount of TOM as sedimentation rates suggested. Trace metal concentrations are enriched as TOM is enriched. V concentrations were higher in the lower but U concentrations were not significantly higher in the lower. This suggests that the lower and upper shales were deposited during a period of low oxygen levels.

Si content for the upper shale was significantly higher than the lower shale. Al and Ti concentrations were both higher in the lower than the upper shale. This suggests a change in source area from the lower shale deposition to the upper shale deposition.

Cerium anomalies were negative for the lower shale, but were not positive for the upper shale. This suggests that the lower AND upper shales were deposited during mainly rising sea level under conditions of low oxygen level.

References