Discrepancy of Organic Richness within the Oatka Creek and Union Springs of the Marcellus Formation

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The Middle-Devonian-aged Marcellus Formation covers a vast expanse across the northern Appalachian Basin. Although a viable shale play, much is still to be discovered about the formation's paleoenvironment conditions that led to organic matter accumulation. The formation consists of three members arranged from oldest to youngest: Union Springs, Cherry Valley Limestone, and Oatka Creek. The Union Springs and Oatka Creek consist of black shale, yet significantly differ in concentration of total organic carbon (TOC). Union Springs black shales contain C_{org} values ranging from 4-16% [1]. Depending on the site where the Oatka Creek member is under inspection, C_{org} content typically ranges from 1-4%, with some outliers as high as 7.5% [1]. The purpose of this study is to provide an explanation for the difference in TOC values between the two black shales by applying geochemical proxies. Degree of pyritization (DOP) is utilized in order to obtain values of iron and sulfur that act as analogues to the oxygen level at the time of deposition and can be used in comparison to TOC values. The values obtained from DOP are dependent on the amount of reactive iron incorporated into the formation of pyrite and are useful in characterizing a black shale environment as oxic, dysoxic, anoxic, or euxinic. Since the destruction or preservation of organic matter is significantly correlated to the oxygen level at the time of deposition, high TOC values would indicate a favorable paleoenvironment for preservation – one that is oxygen depleted and relies on less efficient, anaerobic processes. Ultimately, this work will interpret whether or not oxygen conditions contributed to the differences in TOC preservation.

[1] Werne *et al*. (2002) *American Journal of Science* **302(2)**, 110-143.