

**AAPG Annual Meeting
March 10-13, 2002
Houston, Texas**

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High TOC Values in Sedimentary Rocks of the Victoria Land Basin (Ross Sea, Antarctica) Mark the Initiation of Glacial Advances

Rocks in many condensed sections contain elevated total organic carbon (TOC) values: a condition considered to reflect the effects of slow sedimentation rate and limited dilution of marine organic matter by clastic sediment. Two 50 m thick Oligocene and Miocene glacial sequences penetrated by the CRP-2/2A (Cape Roberts Project) core have been sampled to investigate the relationship between organic matter content and position within a sequence stratigraphic framework. Although TOC values are very low (average=0.3% for both sequences), values as high as 0.6% and 1.5% are observed. The high TOC values occur in rocks immediately above intervals considered to be condensed sections. Plots of TOC against total nitrogen (TN) can be used to define two populations of organic matter in these rocks. 1) Organic matter with very high TOC:TN ratios (average 166) is interpreted to be coal detritus derived from the Beacon Supergroup, whereas 2) organic matter with much lower TOC:TN ratios (average 8.9) is considered to contain much less detrital coal. The samples that have the highest TOC values in each sequence have TOC:TN ratios (15 and 32) that are too high to have been derived largely from aquatic sources. Rather than being the products of clastic sediment starvation, the highest TOC values observed in these two sequences result from sedimentation of buoyant, fine-grained coal clasts in the distal portions of a prograding glacial system. The high TOC values, therefore, identify sediment deposited during the earliest stages of glacial advance.