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Petrographical and geochemical characterisation of lignites, sub-bituminous coals and carbonaceous sediments from the Erin Formation, Southern Basin, Trinidad – Implications on microfacies, depositional environment and organic matter alteration

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ABSTRACT

The Pleistocene tropical lignites of the Erin Formation of southern Trinidad, western tropical Atlantic Ocean, as well as the overlying and underlying sedimentary strata, are here for the first time studied using organic petrological and organic geochemical methods. Six vertical sections were sampled at Granville and South Chatham. The mean huminite (vitrinite) reflectance of the low rank coals and carbonaceous shales at Granville increases through the sections from 0.26 – 1.05 %, indicating a coalification path from lignite to sub-bituminous and even high volatile bituminous coal. This strong increase of reflectance is by no means related to deep burial but to surface-near sweltering, possibly related to self-ignition. Pyrites are strongly oxidized in the thermally altered Granville samples. At South Chatham, all the coals are characterized by low reflectance values (0.15 – 0.39 %) and can be classified as lignite. Pyrite is fresh and sulphur contents are partly high. High sulphur contents at South Chatham might be due to exposure to seawater through transgressive processes during peat deposition or at an early diagenetic stage in a tidal, coastal environment.

Maceral analysis showed the coals at South Chatham to be dominated by huminite (86 - 97 %), with less abundant inertinite (2 - 12 %) and sparsely occurring liptinite (0 – 2 %). The distribution of coal facies based on critical macerals such as humodetrinite and humocollinite suggests formation of these lignites in a reed marsh to wet forest swamp, exhibiting transition into an upper to lower delta plain environment. Similar conclusions are deduced from tissue preservation, gelification, groundwater and vegetation indices of the coals indicating that they are composed predominantly of small herbaceous plants.

Keywords: Erin Formation; Organic petrology; Oxidation; Pleistocene; Trinidad coals