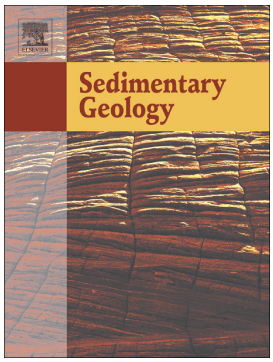

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Luke J. Wooldridge, Richard H. Worden, Joshua Griffiths, James E.P. Utley, Anu Thompson

PII: S0037-0738(18)30155-6
DOI: doi:10.1016/j.sedgeo.2018.06.004
Reference: SEDGEO 5358

To appear in: *Sedimentary Geology*

Received date: 29 January 2018
Revised date: 29 May 2018
Accepted date: 12 June 2018

Please cite this article as: Luke J. Wooldridge, Richard H. Worden, Joshua Griffiths, James E.P. Utley, Anu Thompson , The origin of clay-coated sand grains and sediment heterogeneity in tidal flats. Sedgeo (2018), doi:10.1016/j.sedgeo.2018.06.004

The origin of clay-coated sand grains and sediment heterogeneity in tidal flats

LUKE J. WOOLDRIDGE*, RICHARD H. WORDEN, JOSHUA GRIFFITHS, JAMES E.P. UTLEY, ANU THOMPSON

School of Environmental Sciences, University of Liverpool, Liverpool L69 3GP, U.K.

Corresponding authors (e-mail: luke.wooldridge@liv.ac.uk)

Abstract

The presence and distribution of clay minerals attached to grain surfaces as coats (also known as rims) are of great interest because they affect petroleum reservoir quality via the inhibition of the porosity-occluding quartz cement during prolonged burial and heating. Being able to predict the distribution of clay-coated sand grains in petroleum reservoirs is thus important to help find and exploit anomalously high porosity sandstones deep in sedimentary basins. The few studies focused on the distribution of clay coats in marginal marine sediments derive from surface sediment-based data sets, with limited emphasis placed on the preservation of the surface trends in sediment undergoing eodiagenesis in the near-surface environments. The post-depositional processes of bioturbation (sediment homogenisation) and infiltration of clay into sand-grade sediment have been widely invoked as potential mechanisms that produce clay coats in modern sands and ancient sandstones. However, the potential for such processes to alter surface trends and govern clay-coat distribution in the subsurface remains unconstrained. In this study, we report the development of a novel, quantitative model of clay-coat coverage in order to identify the controlling mechanisms that govern clay-coat distributions. This study has focused on surface and near-surface sediments in the Saltcoats tidal flat deposits of the Ravenglass Estuary, UK. This