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Statistical measures of distribution patterns of silicon and calcium in marine sediments

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We analyze electron microscope X-ray spectroscopy data of recent supratidal marine sediments. Statistical measures are used to characterize the distribution of silicon and calcium in different layers of the sediments. First we present an algorithm to identify layers in sediments having complex boundaries. The method is based on a wavelet multiscale decomposition, designed to detect lines of maximal gradients. After finding the layers we use cluster analysis and symbolic dynamics to filter measurement noise and to classify different density regions. This allows to calculate characteristic patch sizes which reflect the sizes of individual clastic grains and the corresponding pore sizes. Silicon indicates the independent processes in the sedimentation history of certain grains. Calcium is capable to monitor intrinsic early diagenetic processes of biogeochemical calcium mineralization of primary organic matter as documented in more organized distributions with higher clustering.