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Use of electrical conductivity of Holocene deposits in the Nobi plain to analyze depositional environment

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Electrical conductivity (EC) method is simple approach for estimation of depositional environment. Naruhashi et al (2010) indicates the possibility that EC records rapid changes of depositional environment in inner bay floor, on the basis of rapid increasing and decreasing of EC through the faulting event horizons on the Kuwana fault.

In this study, the usefulness of EC of stirred Holocene deltaic sediments from three cores from the Nobi Plain, Japan, was assessed as a proxy for marine transgression and regression. At first, the influence of grain size on EC was evaluated, because for same salinity, finer sediments tend to show higher EC (Yokoyama and Sato 1987). Lack of correlation of EC with mud content for the sediments with >20% mud suggested that permeability was a negligible factor, based on the correlation of mud content to permeability. Then, EC was compared with facies analysis results and the ratios of marine diatom specie. Marine deposits showed high EC (>0.9 mS/cm), terrestrial deposits low EC (<0.4 mS/cm), and brackish deposits intermediate. Because it was positively correlated with the percentage of marine diatom species, EC in inner bay deposits primarily reflected salinity. In the YM core (the youngest of the three cores), EC of the inner bay deposits was weakly positively correlated with clay content, which controls pore water content. EC of inner bay clayey deposits was generally higher in YM than in KZN, suggesting that the lower EC in older clayey sediments results from compaction. These findings suggest that the EC values of fine sediments initially record salinity but may decrease gradually over time under the influence of compaction. Thus, to reconstruct the original salinity, the effects of compaction and of grain size distribution?and especially clay content?should be evaluated.

Keywords: salinity, Holocene, depositional environment, electrical conductivity, Nobi plain