

4.3.P08**The coupling relation between $^{210}\text{Pb}_{\text{ex}}$ and organic matter in sediments of enrichment nutrient lake: An example from Lake Chenghai, China**G.J. WAN¹, J.A. CHEN¹, S.Q. XU¹, F.C. WU¹, E.Y. WAN¹, W. YANG¹ AND P.H. SANTSCHI²¹ State Key Laboratory of Environmental Geochemistry, Institute of Geochemistry, Chinese Academy of Sciences, Guiyang 550002, China;² Department of Marine Sciences, Texas A&M University, Galveston, Texas 77551, USA

Correspondence should be addressed to Wan Guojiang (gjw@ms.gyig.ac.cn)

The fundamental assumption of ^{210}Pb sediment dating is the stable flux of $^{210}\text{Pb}_{\text{ex}}$, which was derived from atmosphere and then transferred into sediments via lake water. When the sedimentation rate is relatively constant, the $^{210}\text{Pb}_{\text{ex}}$ activity in sediments will be exponentially reduced with sedimentation age. $^{210}\text{Pb}_{\text{ex}}$ in lake water is incorporated into sediments mainly via organic particulates. If the sedimentation flux of organic matter in lake water is suddenly increased, $^{210}\text{Pb}_{\text{ex}}$ will be significantly deposited and then transferred into sediments. Such sudden purification effect is obviously unfit for the fundamental assumption of ^{210}Pb dating. On the other hand, the sudden enhancement of $^{210}\text{Pb}_{\text{ex}}$ flux would be indicative of the conspicuous variation of primary productivity of lake water. This problem will be discussed in accordance with the variation trend of $^{210}\text{Pb}_{\text{ex}}$ in the vertical profile of recent sediments of Lake Chenghai, Yunnan, China. The vertical profile of $^{210}\text{Pb}_{\text{ex}}$ activity displays a specific distribution of peaks, and is similar to the vertical profile of C_{org} . This phenomenon seems to be related to the mechanism of constraining the transfer of $^{210}\text{Pb}_{\text{ex}}$ into lake sediments. The average atomic ratios of $H_{\text{org}}/C_{\text{org}}$ and $C_{\text{org}}/N_{\text{org}}$ in Lake Chenghai sediments are 5.51 and 7.04, respectively, indicating that the organic matter was predominantly derived from the remains of endogenic algae. In terms of “deposition-decomposition-accumulation”, the sedimentation fluxes of organic carbon since 1970 were calculated by modeling. The sedimentation fluxes of $^{210}\text{Pb}_{\text{ex}}$ in different years display good synchronous relations with the $F(C_{\text{org}})$, especially in the years of 1972–1974 and 1986–1989. The variation of $F(C_{\text{org}})$ led to the variation of $F(^{210}\text{Pb}_{\text{ex}})$; the variation of $F(^{210}\text{Pb}_{\text{ex}})$ reflects, to some extent, the historical variation of lake productivity.

4.3.P09**3D-mineral distribution during the early diagenesis in shallow marine sediments from XRD-Rietveld analysis**

T. GARCIA, S. FERNANDEZ-BASTERO AND L. GAGO-DUPORT

Vigo University, Campus Lagoas Marcosende s/n, 36200 Vigo, Spain (tatianag@uvigo.es; sbastero@uvigo.es, duport@uvigo.es)

1-D approaches are usually employed for modelling the distribution of minerals in sediment diagenetic processes. This is partly due to the lack on 3D-data about mineral distributions [1]. This procedure yields accurate results on depth-marine sediments, provided that the sediment layers have lateral continuity. However, in shallow systems the starting inhomogeneities for both, geometry of sedimentary facies and mixing of sediments, impose local controls on early diagenesis, leading to the formation of diagenetic regions with variable geometry. Thus 1-D analysis will not be appropriate to model shallow marine systems and 3-D characterization of mineral distributions is required.

In this work we develop a 3D-procedure to study mineralogical variations related to the early diagenesis in mixed siliciclastic-carbonated estuarine systems. XRD-Rietveld method for quantitative phase analysis was applied to a grid of 35 sediment samples every 5 cms up to 25 cm. collected at the Ria de Vigo (NW Spain) by gravity corers.

Mapping of the mineral-contents at several depths have been used to relate the abundance ratios between mineral pairs to the grain-size distributions. This procedure allows us to study the chemical transformation processes, taking into account diffusion (both vertical and lateral) and advection fluxes.

As a result, correlation between sulphide minerals, sulfates and aragonite have been found [2]. The role of iron, from Fe-bearing siliciclastic minerals, as a limiting factor for authigenic pyrite formation and the influence of bacterial biomass on the sulphide reoxidation are also discussed. A conceptual model based on lateral diffusion in inhomogeneities inherited from the surface sediment patterns suggest that the initial sediment distribution plays an important role on the geometry of the geochemical facies observed in depth.

References

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