Potential and limitations of $^{228}Th/^{232}Th$ disequilibria for the dating of high sedimentation marine sequences: Example from Herschel Basin, Beaufort Sea

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Short live isotopes chronologies (^{210}Pb and ^{137}Cs) are widely used to understand recent mass accumulation and sediments rates. For high sedimentation rate sites, disequilibria between ^{228}Th, ^{228}Ra and ^{232}Th provide information on ~10 yr (excess in ^{228}Th) and ~30 yr (deficit in ^{228}Ra) time scales. A two step alpha counting measurement of $^{228}Th/^{232}Th$ radioactive disequilibrium in each sample, with a ≥ 6 months time interval in between, is used to get information on the intermediate $^{228}Ra/^{232}Th$ activity ratio. This approach has been tested in the coastal area of the Herschel Basin (Beaufort Sea, Canada). Two sediment cores were analyzed for their ^{210}Pb, ^{137}Cs contents and $^{228}Th/^{232}Th$ activity ratios. At the shallower site, with coarse sediment deposition, ^{228}Th depicts a deficit vs ^{232}Th thus indicating losses of intermediate ^{228}Ra during sediment transport and deposition, but no significant ^{228}Th uptake meanwhile. Advection of this isotope towards finer sediments site deposition areas seems responsible of this anomaly. Nonetheless, return to equilibrium between ^{228}Th and ^{232}Th at the site follows the growth cruve of the intermediate ^{228}Ra and thus helps putting constraints on the last 30 yr sedimentary history at the site.