Building a self-consistent interpretation of radionuclide profils in Lake Tahoe sediments: other geochemical parameters are required as well

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^{210}Pb, $^{239+240}$Pu, ^{228}Th, ^{226}Ra, ^{235}U and ^{40}K were measured in a sediment core collected in 1998. The ^{210}Pb results may be compared with earlier profiles measured in 1982 and 1991. ^{137}Cs was measured in 1991 and 1998. Trace elements, e.g., Mn, Fe, and Pb, and organic carbon were measured in the same samples. The sediment record in Tahoe exhibits classical redox subsurface peaks of manganese, with iron immediately below (where phosphate also peaks), at depths from 2.5 to 4 cm., indicative of little mixing by organisms below this zone. The excess ^{210}Pb profiles are not a simple exponential, but may reflect a higher sedimentation rate since about 1975, corresponding to a factor of > 2 than in earlier times. This change in rate is consistent with the decrease in organic carbon content concomitant with the disturbance of low organic carbon soils resulting from construction activity in the basin. However, a comparison of the ^{137}Cs and ^{210}Pb profiles are also consistent with mixing down to 5-6 cm. But the $^{239+240}$Pu profile exhibits penetration and subsurface maximum at depths apparently consistent with sedimentation rates calculated from the ^{210}Pb data. The ^{228}Th profile shows mixing in the upper 2-3 cm of sediment, which is consistent with the position of the redox boundary. Geochemical changes associated with the redox zone lead to minimum values for ^{235}U and ^{40}K, and a small maximum for ^{226}Ra. Development of a self-consistent model needs to reconcile the large differences between the ^{137}Cs and $^{239+240}$Pu profiles in relation to their differences in geochemical properties in the water and interaction with sediments.