Mapping schemes versus process models for ^{210}Pb dating soil cores: an example from the everglades of South Florida, U.S.A.

John A. Robbins

C. Holmes

K. Reddy

S. Newman

Two contrasting approaches have emerged for extracting sediment age information from ^{210}Pb profiles: one using algorithms, such as CRS or CIC, to convert individual excess ^{210}Pb activities into dates; the other using process models to "explain" ^{210}Pb profiles and supply chronological information. These are illustrated using data from a nutrient-impacted area of the Everglades wetlands in south Florida. The study area (WCA2A) is bounded by a system of canals, one of which has been a long-term source of phosphorus from upstream agricultural activities. Near the canal, in the strongly impacted area, cattails (*Typha domingensis*) dominate the plant community. Further along a transect extending away from the canal, the community consists of a mix of cattails and sawgrass (*Cladium jamaicense*), and finally, beyond about 8 km, is dominantly sawgrass with interspersed open-water sloughs. A CRS mapping scheme applied to excess ^{210}Pb profiles in cores collected along the transect, generates age-depth relations consistent with depths of peak ^{137}Cs activity. The process model treats plant growth as being controlled by extraction of P from soils via anchoring root networks, and from water and surface soils by adventitious roots. By coupling net soil accretion rates, and indirectly biomass production, to near-surface soil total P concentrations, quite unusual ^{210}Pb profiles are quantitatively well described. Both process model and

mapping scheme yield sediment accumulation rates increasing exponentially at impacted sites during the past several decades. Although successful process models can potentially reinforce inaccurate notions of mechanisms producing observed ^{210}Pb profiles, mapping schemes should be nevertheless considered dating techniques of last resort.