Age dating of sediment cores in Sorsogon Bay, Philippines using ^{210}Pb method: A revisit

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The ^{210}Pb age dating method is a well-established technique for the retrospective assessment of sediment transport in aquatic environments. Previously, this method was applied to characterize sedimentation processes in Sorsogon Bay, Philippines, using the Constant Initial Concentration (CIC) age-dating model to determine sedimentation rates (SR). This study revisits and validates the reported SRs to ensure more accurate age profiles and enhance historical interpretation. Sediment cores SO-01 (CAS), SO-03 (CAD), and SO-07 (SOR) from Madrid et al. (2011) were reanalyzed, assessing all possible combinations of regression lines for ^{210}Pb activity profiles. The sediment age profiles were validated using high-resolution dry bulk density (DBD) and mass accumulation rate (MAR) data, correlating observed peaks with historical events such as Mt. Bulusan eruptions and major typhoons. In core CAD, peaks in DBD and MAR profiles corresponded to Mt. Bulusan eruptions (1933, 1978–1983, 1988, 2006) and typhoons (1947/Jean, 1979/Yayang, 1981/Anding, 1983/Warling, 1988/Unsang, 2006/Reming and Milenyo). CAS and SAM cores, located farther from Mt. Bulusan, did not record volcanic signals but showed sedimentary changes associated with typhoons and anthropogenic influences. SAM exhibited an abrupt sedimentation increase in the 1980s, attributed to intensified urbanization. CAS registered six distinct peaks linked to typhoon events in 1947 (Jean), 1952 (Trix), 1967 (Welming), 1970 (Sening), 1983 (Warling), and 1995 (Rosing).

The findings highlight the importance of constructing reliable sediment age models for understanding sediment provenance as well as environmental changes driven by nature (e.g. extreme weather events, climate change) and human activities (e.g. land use change). Such models are essential tools for advancing climate change research and developing effective coastal management strategies. Integrating DBD and MAR profiles with historical event records proved to be a robust approach for validating age profiles and reconstructing sedimentation history.