

Use of ^{137}Cs and $^{210}\text{Pb}_{\text{ex}}$ peaks produced by events in the catchment for dating sediments in the Jiulongdian Reservoir, Chuxiong, Yunnan Province, China

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Abstract A 393-cm long sediment core was collected from the Jiulongdian Reservoir in 2004. In addition to the expected 1963 ^{137}Cs peak at a depth of 231–237 cm, there was an unusual ^{137}Cs and $^{210}\text{Pb}_{\text{ex}}$ peak at a depth of 15–21 cm. The ^{137}Cs and $^{210}\text{Pb}_{\text{ex}}$ peak is related to a forest fire occurring in the spring of 1998 and can be used for sediment dating. The $^{210}\text{Pb}_{\text{ex}}$ peak at a depth of 331–337 cm reflects the surface horizon of the original soil beneath the reservoir, which has been buried by the reservoir deposits since the reservoir was built in 1958. Based on the storage volume vs depth relationship for the reservoir, the amounts of sediment deposited during the periods 1959–1962, 1963–1997 and 1998–2003 were estimated to be 249.48×10^4 t, 262.78×10^4 t and 30.94×10^4 t, respectively. The corresponding specific sediment yields for the three periods are estimated to be $2421.2 \text{ t km}^{-2} \text{ year}^{-1}$, $291.5 \text{ t km}^{-2} \text{ year}^{-1}$ and $200.2 \text{ t km}^{-2} \text{ year}^{-1}$, respectively. The highest specific sediment yields were associated with deforestation during the “Great Leap Forward” of 1958–1959. However, the severe erosion resulting from deforestation rapidly declined when the natural vegetation re-established itself after deforestation ceased.

Key words ^{137}Cs ; $^{210}\text{Pb}_{\text{ex}}$; reservoir; sediment core; forest fire; deforestation; soil erosion