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# Determination of recent sedimentation rates and pattern in Lake Naini, India by $^{210}$Pb and $^{137}$Cs dating techniques

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## ABSTRACT

Environmental $^{210}$Pb (natural) and $^{137}$Cs (anthropogenic) dating techniques were applied to determine recent sedimentation rates and pattern in Lake Naini, Uttar Pradesh, India. Core samples from different locations in the lake were collected and analysed for $^{210}$Pb and $^{137}$Cs. From the analysis it appears that the lake is not reducing in depth at a rate reported by earlier investigations. Recent sedimentation rate, estimated by the $^{210}$Pb dating technique, has been found to be fairly constant at one location (the mean dry mass sedimentation rate being 0.112±0.010 g cm$^{-2}$ a$^{-1}$) but varying at other locations in the lake (the dry mass sedimentation rates ranging from 0.026±0.010 to 0.421±0.050 g cm$^{-2}$ a$^{-1}$). At all locations the short-term rates (for the last three decades) derived from $^{137}$Cs, a fall-out nuclide, have been observed to be marginally higher compared to long-term (last 120–150 yr) rates deduced from $^{210}$Pb. The spatial and depthwise distribution of $^{137}$Cs and $^{210}$Pb and spatial variation of surface $^{210}$Pb/$^{137}$Cs in the obtained sediment cores of the lake, along with their textural properties (like porosity and water content), provide preliminary information on the existence of different depositional zones throughout the lake and on the physico-chemical nature of the sedimentation process in the lake (i.e., bioturbation, slumping, sediment focusing, land erosion/land slide etc).