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## Surface denudation and soil erosion over 300 ka at the Otago upland (New Zealand) using $^{10}\text{Be}$ and $^{239+240}\text{Pu}$

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The Tor Exhumation Approach (TEA) traditionally uses large residual granitic landforms as indicators for surface lowering over time of their surrounding landscape. This study challenged the broad applicability of this approach by using large metamorphic residual landforms instead of the traditional plutonic rock formations. We applied in-situ cosmogenic nuclide techniques ( $^{10}\text{Be}$ ) along vertical landforms (schist-tors) on the Otago upland in southern New Zealand to investigate the capabilities of the TEA within another major rock type. The aim of the investigation was to decipher surface denudation models for the last ~100 ka. The experiment was coupled with fallout radionuclides ( $^{239+240}\text{Pu}$ ) in nearby soils to compare the Pleistocene / Holocene surface denudation rates with the Anthropocene (last ~60 years).

The surface ages of the eight investigated schist-tors was between ~20 ka and ~300 ka. This allowed the numerical modeling of continuous surface denudation rates with highest values near 0.16-0.20 [ $\text{mm year}^{-1}$ ] (about 140–180 [ $\text{t km}^{-2}\text{year}^{-1}$ ]), and over a period that has not yet been achieved. The fallout radionuclide study resulted in two different mass redistribution rates. Average soil erosion along a ridge was ~400 to ~850 [ $\text{t km}^{-2}\text{year}^{-1}$ ], whereas in an adjacent valley soil deposition rates reached ~130 to ~1,500 [ $\text{t km}^{-2}\text{year}^{-1}$ ]. In conclusion, this study provides a new basis on how schist-tors emerge at two different landscape positions (ridges and valleys). In addition, differences between past surface denudation rates and modern ones could be revealed.