Actinides, accelerators and erosion

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Fallout isotopes can be used as artificial tracers of soil erosion and sediment accumulation. The most commonly used isotope to date has been ^{137}Cs, however, concentrations of ^{137}Cs are significantly lower in the Southern Hemisphere, and furthermore have now declined to 35% of original values due to radioactive decay. As a consequence the future utility of ^{137}Cs is limited in Australia, with many erosion applications becoming untenable within the next 20 years, and there is a need to replace it with another tracer. Plutonium could fill this role, and has the advantages that there were six times as many atoms of Pu as of ^{137}Cs in fallout, and any loss to decay has been negligible due to the long half-lives of the plutonium isotopes. Uranium-236 is another long-lived fallout isotope with significant potential for exploitation as a tracer of soil and sediment movement. Uranium is expected to be more mobile in soils than plutonium (or caesium), and hence the ^{236}U/Pu ratio will vary soil depth, and hence could provide an independent measure of the amount of soil loss. This talk will discuss accelerator based ultra-sensitive measurements of plutonium and ^{236}U isotopes and their advantages over ^{137}Cs as tracers of soil erosion and sediment movement.