no till) systems and getting an indication of the SOM stability.

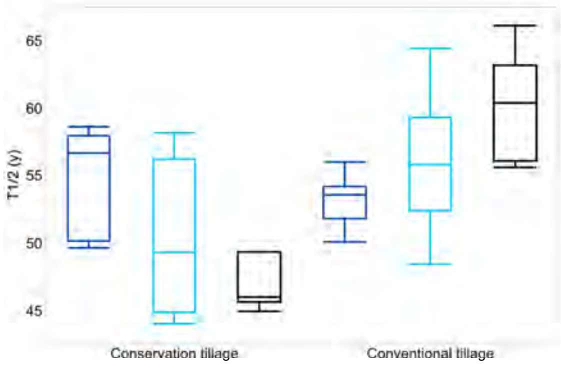

Figure 2. Half-life of SOM (in years) calculated according to Balesdent and Balabane method for one of the four sites.

The next step is to develop a usable model based on the changes in $\delta^{13}C$, $\delta^{15}N$ and C and N concentrations in different soil fractions (essentially combining the two stable isotope approaches used above) to accurately and cost effectively determine SOM stability.

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Mobility and Bioavailability of Radionuclides in Soils

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It is crucial to understand the behavior of radionuclides in the environment, their potential mobility and bioavailability related to long-term persistence, radiological hazards, and impact on human health. Such key information is used to develop strategies that support policy decisions. The environmental behavior of radionuclides depends on ecosystem characteristics. A given soil's capacity to immobilize radionuclides has been proved to be the main factor responsible for their resulting activity concentrations in plants. The mobility and bioavailability of radionuclides in soils is complex, depending on clay-sized soil fraction, clay mineralogy, organic matter, cation exchange capacity, pH and quantities of competing cations. Moreover, plant species have different behaviors regarding radionuclide absorption depending on soil and plan characteristics.

The authors have recently reviewed information related to the mobility and bioavailability of key artificial and natural radionuclides (e.g. ^{137}Cs, ^{90}Sr, $^{239,240}Pu$, ^{241}Am, ^{238}U, ^{226}Ra, ^{232}Th) in different soil types under various environmental conditions and identified key knowledge gaps (Iurian *et al.*, 2015). The review was published as a book chapter in "*Radionuclides in the Environment: Influence of chemical speciation and plant uptake on radionuclide migration*" by Springer. The manuscript highlights that by changing soil and environmental conditions, radionuclides can be converted from a potentially mobile to an immobile form or vice versa, having a direct effect on their uptake by plants. For example, the soil redox potential, the pH, the organic matter content and composition, and the sorption to mineral soil constituents represent the main factors controlling the chemical form of radionuclides in soil.

This knowledge is particularly useful for developing long-term remediation and management strategies for terrestrial ecosystems potentially being contaminated by artificial radionuclides or radionuclides originating from uranium mining legacy sites, with the goal of limiting the radionuclides' transfer to the food chain.

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Carbon Storage in Soils: Climate vs. Geology

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In a recently published Nature Geoscience article, scientists took a closer look at the much-discussed topic of carbon storage in soils under Climate Change. In a large-scale study across Chile and the Antarctic Peninsula, they showed that the role of precipitation and temperature in controlling carbon dynamics in soils is less than currently considered in Global Ecosystem Models.

Soils are important for carbon (C) storage and thus for atmospheric CO_2 concentrations. Whether soils act as a sink or source for atmospheric C generally depend on climatic factors, as they control plant growth (driving the incorporation of C into the soil), the activity of soil microorganism (driving the release of C from the soil to the atmosphere), as well as several other chemical processes in soils. However, we still do not fully understand the response of soil C to Climate Change. An international team of researchers led by Pascal Boeckx and Sebastian Doetterl from Ghent University, Belgium and Erick Zagal from University of Concepcion in Chile, have been investigating the interaction between climate, different types of soil minerals, and soil as sink or source for C. They studied this interaction by sampling soils from numerous locations representing different vegetation types in Chile and the Antarctic Peninsula.

“Models for predicting the impacts of Climate Change on nature have generally not sufficiently considered the role of soils in buffering or enhancing the potential impacts of Climate Change” Doetterl says. With their work, the scientists showed the importance of understanding various biogeochemical processes in soils that have developed under different geologic and climatic conditions and how these two aspects are connected. Chile, by its unique geographical position, which crosses many climate zones, and with a very variable geology, offered an ideal natural laboratory to study interactions between climate and geochemistry and their control on carbon storage in soils. For the first time, the close connection of geochemical and climatic controls on soil C dynamics could be shown on a large scale.

“Soils in regions with warmer and wetter climate are generally more reactive than soils in dry or very cold regions” Erick Zagal explains, “These more reactive soils can stabilize more C, for example, adsorbing carbon on their mineral surfaces.” The adsorption of C onto minerals protects it from being decomposed by microorganism, which would lead to CO_2 production that ultimately ends up in the atmosphere and leads to Climate Change.

So what is the more important factor for C storage in soils: climate or geology? The answer is, as expected, complex but can be broken down to a few general statements.

“The interesting thing we saw in our analysis is that climate does not act as the sole control on how much C is stored in soils”, Pascal Boeckx explains. Climate acts rather indirectly as a control on those elements in the soil system, such as soil minerals, that directly stabilize C. If global models now focus only on climatic variables for predicting soil C storage, they are excluding the fundamental interactions and feedbacks of the soil geochemistry on the global C cycle.

“Whether Climate Change can trigger a response in soils to either stabilize or release C is, therefore, mostly a question of the geochemical features of a soil and the climatic conditions under which these soils developed.” Doetterl says. For example, in arctic regions, a temperature increase might enhance the stabilization of C in soils with reactive minerals and partly compensate the