EGU22-11507
https://doi.org/10.5194/egusphere-egu22-11507
EGU General Assembly 2022

In situ ^{14}C-^{10}Be disequilibrium suggests a recent and major denudation event of French Massif Central, despite slow tectonic deformation.

Sebastien Lenard[1], Maarten Lupker[2], Irene Schimmelpfennig[1], Vincent Godard[1], Clement Desormeaux[1], Negar Haghipour[3], Georges Aumaître[1], Karim Keddadouche[1], and Fawzi Zaidi[1]

[1]Aix-Marseille Université, CNRS IRD INRA Collège de France, CEREGE, France

[2]Geological Institute, ETH Zürich, Switzerland

[3]Ion Beam Physics, ETH Zürich, Switzerland

Geomorphologists classically compute denudation rates from in situ cosmogenic ^{10}Be concentrations. A major assumption is that denudation rates remain steady during the ^{10}Be integration time scale. But early ^{14}C-^{10}Be data we presented last year at this conference suggested that this is hardly tested in environments slowly deformed by tectonics, with integration time covering thousands of years, and erosion rates from 10 to 100 mm/ky.

Here, we extended our ^{14}C-^{10}Be dataset to test recent and substantial shifts in denudation. ^{14}C is more sensitive than ^{10}Be to recent and short-term changes in denudation, because of a shorter half-life (5,700 y versus 1.4 My). Studies (Hippe, 2017; Mudd, 2017; Skov et al., 2019; Hippe et al., 2021) have discussed this application of coupled ^{14}C - ^{10}Be measurements.

We carried out in situ ^{14}C measurements on river sand which has available ^{10}Be date (Desormeaux et Al., 2021). The studied mountain range is called Massif Central and is west of the European Alp foreland, in southern France. Elevation is ~700 m on average, with an elevated low-relief surface and a steep escarpment along the Cevennes Fault bordering the Alp foreland. The area has a homogeneous lithology rich in quartz. Past glaciations were of limited extent. There is little space for sediment storage, thin soils, no dams, and presently limited anthropic activity. Massif Central is only impacted by slow tectonic deformation. Landslides are very rare but erosion processes are active.

Our new ^{14}C results combined with Desormeaux et al., 2021's ^{10}Be data confirm the substantial ^{14}C-^{10}Be disequilibrium. ^{14}C apparent denudation rates are several times higher than ^{10}Be denudation rates. We explore four end-members which could explain such a disequilibrium. This exploration suggests that only major and recent events in denudation could produce such a disequilibrium, and that the landscape we presently see is rather transient than steady.