Depositional flux of meteoric ^{10}Be: Observations from northern Britain

Aaditya Nath Kapil[1,2], Jon Telling[2], Ana Carracedo[3], Vasile Ersek[1], Joseph Graly[1]

(*Aaditya.Kapil@northumbria.ac.uk)

[1]Northumbria University, UK, [2]Newcastle University, UK, [3]Scottish universities Environmental Research Centre

This presentation participates in OSPP

Outstanding Student & PhD candidate Presentation contest

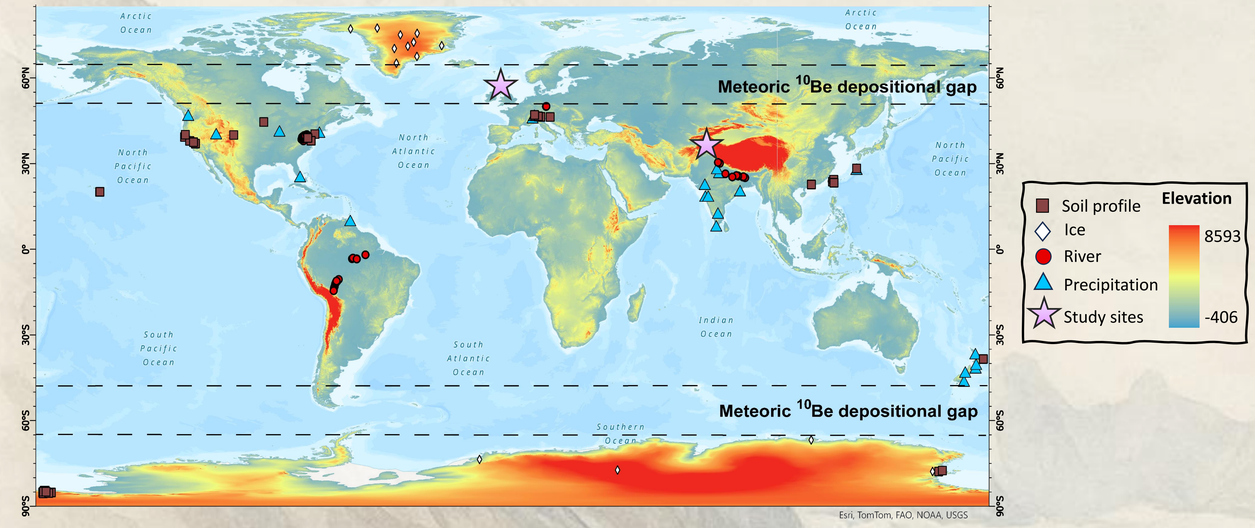
EGU25-922 AS4.20

1. Background

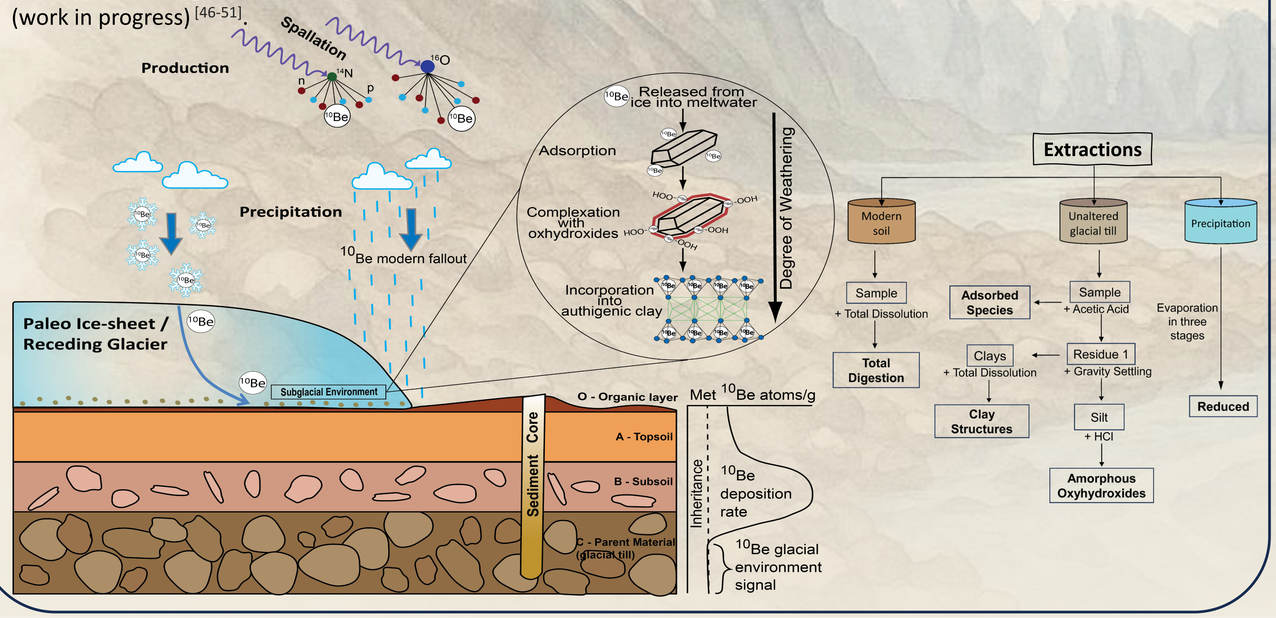
- Glaciers influence water, sediment, and elemental cycles in warming climate, impacting **atmospheric CO_2** levels and climate evolution through **chemical weathering**[1-4].
- Silicate weathering produces distinct mineral tracers: **clays, oxides, and oxyhydroxides**. **Meteoric ^{10}Be** has the potential to be used as a tracer for glacier-induced chemical weathering since it can be incorporated within **authigenic minerals**[5-7].
- $^{10}Be_{met}$ in glacial soil profiles includes **modern deposition** at the top horizons and an **inherited fraction** from soil's parent material at the lower horizon that can serve as **archives of sub-glacial weathering processes**[8-12].

2. Aims

1. Measure $^{10}Be_{met}$ deposition rates in modern precipitation and dated glacial sediment archives, addressing the data gap in 50°-70° latitude and high-altitude regions [13-45].

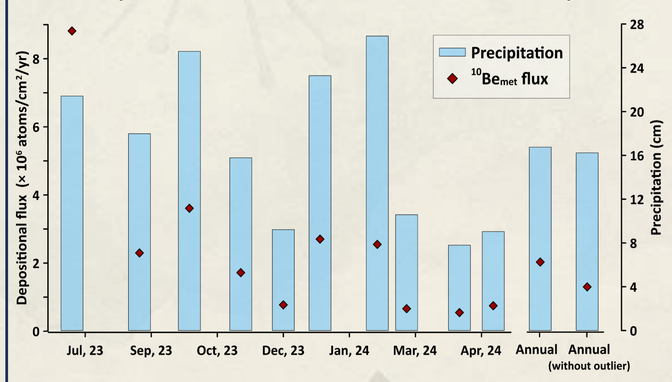


2. Analyse the degree to which, products of chemical weathering within glacial sediments date to the glacial period (work in progress) [46-51].

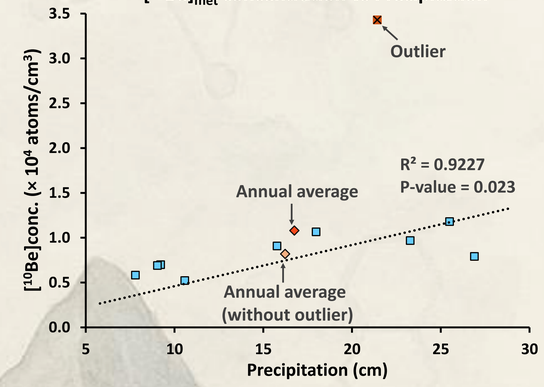


3. Results

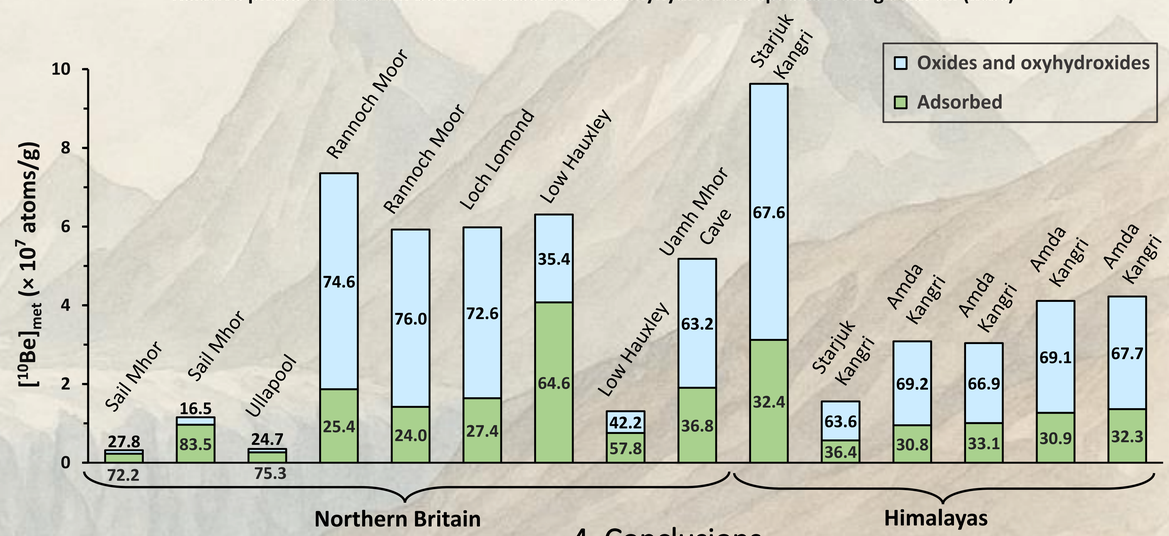
Precipitation and meteoric ^{10}Be modern flux relationship



$[^{10}Be]_{met}$ concentration vs Precipitation



Relative phase distribution between adsorbed and oxyhydroxides species from glacial till (..tbc)



4. Conclusions

- We present the **first field observation** of contemporary meteoric $^{10}Be_{met}$ deposition rates from 50-60°N latitude.
- **Strong correlation** of $^{10}Be_{met}$ (**R^2 = 0.92**, **P-value = 0.023**) with **precipitation**, consistent with a **scavenging effect**, except **July '23** (**Storm Poly- outlier**).
- **Deposition flux= 1.29 × 10^6 atoms/cm²/yr** (or **2.03 × 10^6** with outlier); matches model outputs (**Heikkilä et al., 2015**: **1.22 × 10^6**) [52].
- Phase distribution of $^{10}Be_{met}$ from sequential extractions: **~70% oxyhydroxides and 30% adsorbed** species, exceptions at Sail Mhor, Ullapool, and Low Hauxley- possibly due to lithological controls.

5. References and Contact