

Supporting Information

Detection of Soil Erosion Hotspots in the Croplands of a Typical Black Soil Region in Northeast China: Insights from Sentinel-2 Multispectral Remote Sensing

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Estimation of soil erosion rates based on ^{137}Cs inventory conversion model

We used the Simplified Mass Balance Model (SMBM) to convert ^{137}Cs inventory to net erosion rates ($\text{t ha}^{-1} \text{ yr}^{-1}$). First, the ^{137}Cs reference inventory was corrected to the sampling year according to Equation (1):

$$N_{2021} = N_s \left(\frac{1}{2} \right)^{\frac{2021-s}{30.12}} \quad (1)$$

where N_{2021} is the reference inventory of ^{137}Cs corrected to 2021 (Bq m^{-2}), N_s is the reference inventory (Bq m^{-2}) in the sampling year.

Second, Equation (2) was used to calculate the ^{137}Cs loss ratio:

$$C_{SL} = \frac{A_{ref} - A}{A_{ref}} \quad (2)$$

where C_{SL} is the ^{137}Cs loss ratio, A_{ref} is the local ^{137}Cs reference inventory (Bq m^{-2}), and A is the measured ^{137}Cs inventory at the sampling site (Bq m^{-2}).

Finally, SMBM was used to estimate the net erosion rates for all the collected soil samples at three slope positions:

$$SL = \frac{10Bd \left(1 - (1 - C_{SL})^{\frac{1}{T}} \right)}{P} \quad (3)$$

where SL is the mean annual soil loss ($\text{t ha}^{-1} \text{ yr}^{-1}$), B is the soil bulk density (kg m^{-3}), d is the depth of the plow layer (m), P is the particle size correction factor defined as the ratio of the ^{137}Cs concentration of mobilized sediments to that of the original soils, the median (2.14) of the range recommended by Walling and He (1.78-2.5) was used in this study, and T is the time elapsed since the initiation of ^{137}Cs accumulation (yr).

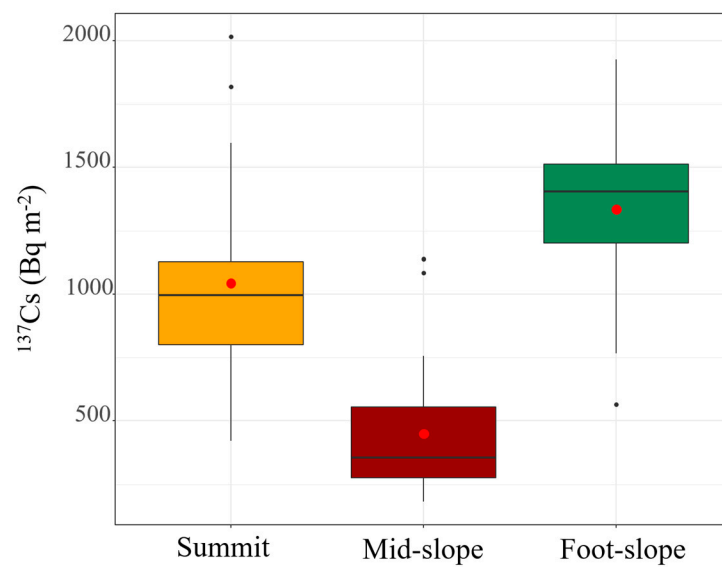


Figure S1. ^{137}Cs inventory at Summit, Mid-slope, and Foot-slope positions. Red dots indicate average value per group.

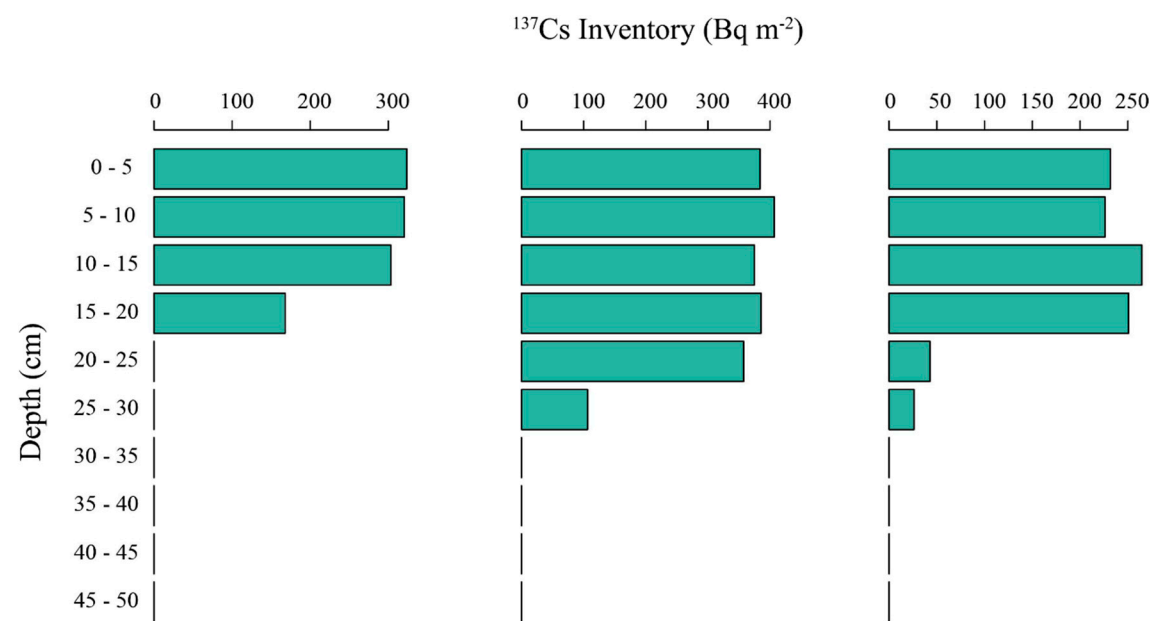


Figure S2. Vertical distribution of ^{137}Cs inventory of the three soil pits at Summit positions.