

# Human activities have been a key driver of hydraulic erosion changes in northeastern China over the past 37 years

Li Hua<sup>1</sup>, Qi Tang<sup>1</sup>, Chongfa Cai<sup>1</sup>, Long Jiang<sup>1</sup>, and Chongfa Cai<sup>1</sup>

<sup>1</sup>Huazhong Agricultural University College of Resources and Environment

March 7, 2023

## Abstract

Northeast China is experiencing severe soil erosion, resulting in land degradation and nutrient loss. Among them, hydraulic erosion poses the greatest threat to food security. Combining various multi-source data, we applied the modified soil erosion equation (RUSLE) to evaluate hydraulic erosion modulus in Northeast China's black soil region(1985–2021). We used the threshold segmentation and residual analysis method to quantify the relative roles of climate change and human activities on hydraulic erosion. The outcomes were presented below: (1) The yearly mean hydraulic erosion modulus was  $804.78 \text{ t} \cdot \text{km}^{-2} \cdot \text{a}^{-1}$  and decreases significantly with a slope of  $-11.114 \text{ t} \cdot \text{km}^{-2} \cdot \text{a}^{-1}$ . The area with significant growth in erosion modulus covered 23.77% of the overall area and was mainly spread in grassland and farmland. The areas with a significant decrease in erosion modulus covered 19.82% and were mainly spread in natural forests. (2) In areas with significant increases in erosion, 20.39% of the total area was attributed to anthropogenic factors and 3.38% of the total area was attributed to natural factors. In areas where soil erosion was significantly reduced, 17.67% and 2.15% were attributed to ecological restoration and natural factors, respectively. (3) Deforestation, grassland degradation, and unreasonable farming still exist. The area of sloping cropland ( $6^\circ$ ) increased by  $133.9 \text{ km}^2$  per year, and sloping land erosion increased by  $0.187 \times 10^{10} \text{ t}$  per year. The focus of soil erosion prevention and control in northeast China is ecological restoration of grasslands, sloping land management, and conservation tillage.

## Hosted file

20230306.docx available at <https://authorea.com/users/593189/articles/628329-human-activities-have-been-a-key-driver-of-hydraulic-erosion-changes-in-northeastern-china-over-the-past-37-years>