Soil erosion rates at field plot studies in Bulgaria

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Soil erosion is recognized as the most serious soil degradation process on the territory of Bulgaria. This report aims at presenting results from the field plots for soil erosion studies in Bulgaria.

Field plots have been set up in 9 experimental sites, belonging to 6 research institutes, to study soil erosion at diverse soil, climate, topography, cover and management conditions in agricultural and forest lands since 1958. The slope of the plots ranged from 9.5 to 26.6%, the lengths were from 4 to 70 m and the area was from 12 to 350 m^2. Reported average annual data respond to measurement periods from 4 to 21 years.

The average annual number of erosive rains varied between the sites from 1 to 7 and the respective amount of a single event – from 15 to 24 mm. The annual kinetic energies varied between study sites from 7.7 to 29.3 MJ ha^{-1} and the rainfall erosivity indices from 204 to 796 MJ mm ha^{-1} h^{-1}. In addition to the spatial variability, the studied rainfall parameters varied also temporally from year to year.

The mean average annual soil loss from the 21 different soils found at the 9 experimental sites was 15.3 t/ha/y. The average annual soil losses from 3 Haplic Kastanozems ranged from 15.6 to 42.5 t/ha/y and those from 14 Chromic Luvisols – from 0.8 to 75.4 t/ha/y. The mean standard error of the soil losse, characterizing their temporal variability was 4 t/ha/y, varying from soil to soil from 0.2 to 13.3 t/ha/y. The average annual soil loss from Dystic Cambisol measured from 1960 to 1970 was 17.8 t/ha/y with standard error 5.4 t/ha/y but 42.8 t/ha/y and standard error 10.5 t/ha/y when measured between 1985 and 1988.

The mean soil loss rate found for cover crops (wheat, triticale, rye, medick, perco, grass mixture and brassica) is 0.8 t/ha/y and that for row crops (maize, sunflower and oriental tobacco) is 2.5 t/ha/y. The mean standard error of the soil erosion rates in the discussed data set is 0.6 t/ha/y, varying from 0.03 t/ha/y to 1.7. Average annual amount of soil eroded from grass varied from 0.03 t/ha/y with standard error 0.01 t/ha/y to 6 t/ha/y with standard error 2 t/ha/y. Observed average annual soil loss from Scots pine plantations was 0.03 t/ha/y with standard error 0.01 t/ha/y and that from thin Oak forest was 0.47 t/ha/y with standard error 0.16 t/ha/y.

Magnesium isotope compositions of CAIs from Rumuruti chondrites

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Introduction

Recently, Rout and Bischoff [1] analysed 101 Ca,Al-rich inclusions (CAIs) from 20 R chondrites. From three hibonite-bearing CAIs (H030/L (from Hughes 030), 2446D/2L (NWA 2446), and 1476/124 (NWA 1476)) and one spinel-plagioclase-rich CAI (753C/51 from NWA 753) Mg isotope compositions were obtained.

Results and Discussion

None of the inclusions show ^{26}Mg excess corresponding to a canonical ^{26}Al/^{27}Al ratio [2]. Only the hibonite-rich CAI (H030/L) studied earlier [3] shows a resolvable excess of ^{26}Mg, which corresponds to an initial ^{26}Al/^{27}Al ratio of ~7 x 10^{-7}. Surprisingly, this CAI was found within a type 4 lithology of the Hughes 030 chondrite [3], whereas the two other hibonite-bearing CAIs having no ^{26}Mg excess were found in type 3 lithologies. The upper limits for the $(^{26}Al/^{27}Al)_0$ in the CAIs 2446D/2L, 1476/124, and 753C/51 are <3x10^{-6}, <5x10^{-6}, and <5x10^{-7}, respectively. Hibonites in 2446D/2L are characterised by having isotopically light magnesium: F_{Mg} up to -4.7‰. For hibonites in H030/L a high ^{27}Al/^{24}Mg ratio of up to ~57000 was obtained.

Absence of resolvable ^{26}Mg excess in the CAIs 2446D/2L and 1476/124 is not related to post-accretion metamorphism. Most probably, they formed from percursors with lower than canonical ^{26}Al/^{27}Al ratio. On the other hand CAI 753C/51 is from a metamorphosed lithology and its magnesium isotope composition has been disturbed. Inclusion H030/L is similar to the HAL-type CAIs [4,5] as inferred from its high ^{27}Al/^{24}Mg ratio and low $(^{26}Al/^{27}Al)_0$ values and formed by distillation of the precursors. Some O-isotope data on R-chondrite CAIs will also be presented at the meeting.

[1] Rout & Bischoff (2008) *MAPS* **43**, 1439-1469. [2] MacPherson *et al*. (1995) *Meteoritics* **30**, 365-386. [3] Bischoff and Srinivasan (2003) *MAPS* **38**, 5-12. [4] Lee *et al*. (1979) *Astrophys. J.* **228**, L93-L98. [5] Hinton & Bischoff (1984) *Nature* **308**, 169-172.