

Pedogenic development and effects of wildfires in high mountain soils revealed by their magnetic properties.

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The magnetic properties of Cambisols and Umbrisols from Bulgaria, developed in different altitudinal zones are expression of the complex origin of the iron oxides present – inherited from the parent rock, pedogenically formed, and in fire-affected areas - appeared as a result of mineral transformations during wildfires. We present detailed mineral magnetic study of four profiles of high-mountain soils formed during the Holocene from Rila and the Rhodopes mountains. Pedogenic magnetic enhancement with strongly magnetic superparamagnetic (SP) and larger stable single domain (SD) grains exhibits clear altitudinal separation. SP magnetite particles are in a small amount and detected only in forest soils. The Umbrisol developed immediately above the timber line contains only coarser particles. The humic horizons in the Cambisol profiles studied become progressively more enhanced with stable remanence carrying grains with increasing altitude. It is supposed that grain growth is the dominant process of pedogenic enhancement in high mountain soils. Umbrisols are characterized by weak magnetic signal in the peat-enriched uppermost levels. When affected by fire, the soil shows higher total C and N content in the upper 10cm. However, the effect of burning in magnetic signature is visible down to 15cm depth, expressed by higher content of strongly magnetic fraction as compared to unburnt soil from the same area. Significant amounts of low-crystallinity iron oxyhydroxides are also detected through iron oxalate extraction (Feo concentrations of 5 - 8 g/kg).