



Relationship between fire temperature and changes in chemical soil properties: a conceptual model of nutrient release

Edivaldo L.Thomaz (1) and Stefan H. Doerr (2)

(1) Universidade Estadual do Centro-Oeste - UNICENTRO, Soil Erosion Laboratory, Department of Geography, Guarapuava, Brazil (edivaldo.thomaz@pq.cnpq.br), (2) Institute of Environmental Sustainability, School of the Environment and Society, Swansea University, Singleton Park, Swansea SA2 8PP, United Kingdom (s.doerr@swan.ac.uk)

The purpose of this study was to evaluate the effects of fire temperatures (i.e. soil heating) on nutrient release and aggregate physical changes in soil. A preliminary conceptual model of nutrient release was established based on results obtained from a controlled burn in a slash-and-burn agricultural system located in Brazil. The study was carried out in clayey subtropical soil (humic Cambisol) from a plot that had been fallow for 8 years. A set of three thermocouples were placed in four trenches at the following depths: 0 cm on the top of the mineral horizon, 1.0 cm within the mineral horizon, and 2 cm within the mineral horizon. Three soil samples (true independent sample) were collected approximately 12 hours post-fire at depths of 0–2.5 cm. Soil chemical changes were more sensitive to fire temperatures than aggregate physical soil characteristics. Most of the nutrient response to soil heating was not linear. The results demonstrated that moderate temperatures ($< 400^{\circ}\text{C}$) had a major effect on nutrient release (i.e. the optimum effect), whereas high temperatures ($> 500^{\circ}\text{C}$) decreased soil fertility.