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Fire effects on physical properties of Andisols (Tenerife, Canary Islands)

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Forest fires modify the main properties of affected soils. Soil physical properties of Andisols with pine forest burned were evaluated. Five burned zones were compared to unburned counterparts. Soil texture, structure, bulk density, water retention capacity and water repellency were determined. As most studies report, soils showed an increase in the sand and/or silt content related to a noticeably reduction in clay content in the zones affected by fire. According to these reports, cementation processes involving Al and Si hydroxides as cements during the fire are the main factors controlling this behaviour. Regarding to soil structure, aggregation and aggregate stability decreased considerably in burned zones, as is usually reported. The decrease in soil binding such as organic matter, clay content and short-range order products explains this trend. Nevertheless, bulk density and water retention capacity, some of the main characteristic properties of Andisols, showed contradictory patterns compared to most studies. Water retention capacity at -33 kPa increases considerably after fire, whereas at -1500 kPa no major changes were observed. Preliminary conclusions indicate that the high water retention of ashes included into the soil explains this trend at -33 kPa. On the other side, the decrease in organic matter and clay content offsets the water retention increase at -1500 kPa due the ash incorporation. In opposition to most studies, an important reduction in bulk density was observed in burned soils. Some authors have reported that the desiccation process leads to a loss of aggregation resulting in low-density microaggregates in Andisols of Tenerife. These soils are known locally as “dusty-soils”. Finally, a decrease of soil water repellency was also observed in most zones after fire, despite a large number of studies reporting the opposite. The soil organic matter decline might be the key factor of this trend.