Do wildfires pose a risk of contamination by mercury?

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The increased frequency, severity and extent of wildfires over the past decades have become a major societal and environmental concern in Mediterranean-type climate regions across the world, including Portugal. These concerns are further aggravated by the likely future climate conditions, increasingly propitious to wildfire ignition and spreading.

Whilst the impacts of wildfires on vegetation and soil hydrological processes have received considerable research attention, little is known about contaminants in ashes and burnt soils, and their mobilization with time-since-fire. In particular, the fire-induced release of mercury (Hg) into the environment, which assumes a singular concern due to its toxicity, persistence and tendency to bio-accumulate, with potentially harmful impacts on the environment as well as human health, have been neglected.

Hence, as a contribution to understand the role of wildfire in the Hg mobilization, a field-monitoring program was conducted by the Eco-hydrology Lab of CESAM under the scope of the FIRECNUTS project (PTDC/AGR-CFL/104559/2008). Levels of Hg were analysed in various burnt and unburnt eucalypt and pine plantations in north-central Portugal (Sever do Vouga municipality). Soils and ashes were collected immediately after the fire as well as 4 months later, after a period of heavy rainfall. Mercury contents of the soil and ash samples were determined using an Hg analyser, in which samples were thermally decomposed by controlled heating. The final decomposition products were passed through an Hg amalgamator heated to 700 °C and Hg was released and detected by absorption spectrometry at 254 nm.

Major findings of this study revealed that: ashes exhibited higher Hg content relatively to soils in both forest plantations; soils and ashes from eucalypt stands were consistently enriched in Hg relatively to pine; and post-fire rainfalls had a key role in the Hg washout from ashes, leading to substantial losses over time.

Overall, this study brings a new insight on the importance of wildfire and subsequent rainfall in the mobilisation of Hg accumulated in the easily-erodible ashes, which poses a considerable contamination risk to downstream aquatic habitats, especially in eucalypt-dominated areas.

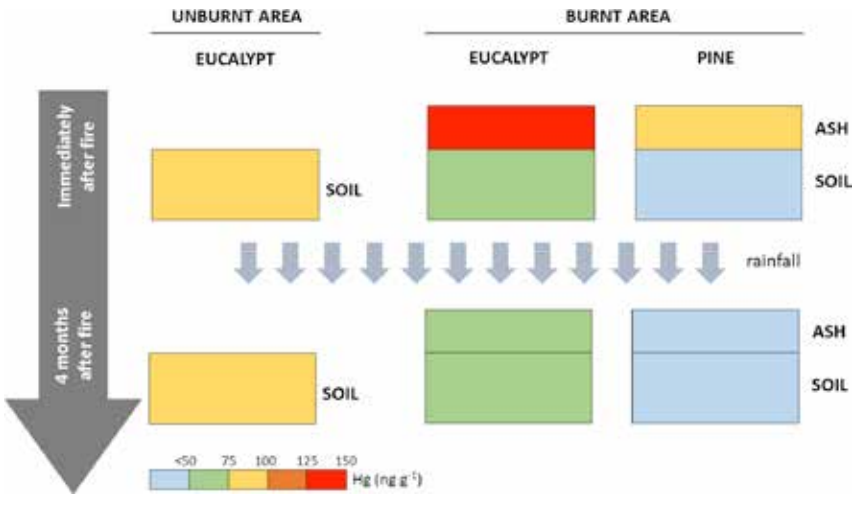

FIGURE 1
Mercury concentrations (ng g-1) in soils and ashes collected immediately after fire and 4 months later in unburnt eucalypt and burnt eucalypt and pine forest plantations in Ermida (Sever do Vouga).