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The normalised wildfire ash index (NWAI): a remote sensing approach for quantifying post-wildfire ash loads

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The impacts of wildfire ash, the powdery residue from fuel burning, on post-fire ecosystems are many and diverse. Ash is a source of nutrients and can help the recovery of vegetation. It can also contain substantial amounts of recalcitrant carbon and thus contribute to long-term carbon storage. In its initial state, the ash layer on the ground can protect the bare soil, mitigating post-fire water erosion by runoff. However, when the adsorbent capability of this layer is exceeded, ash can be transported into the hydrological network and be a major contributor to water contamination. Ash can also contribute to post-fire mass movements such as debris flows.

The eco-hydro-geomorphic impacts of ash on post-fire ecosystems are therefore important, but remain poorly quantified. A fundamental step in that direction is the understanding of ash production and distribution at the landscape scale, which would allow incorporating ash as a key parameter into post-fire risk models.

We have developed a new spectral index (NWAI) using Landsat imagery to model the spatial distribution of ash loads in the post-fire landscape. It was developed based on a severe wildfire that burnt ~13,000 ha of dry eucalyptus forest near Sydney and has also been tested for a forested area burnt by the catastrophic 2009 Black Saturday fires near Melbourne. Although ecosystem and fire characteristics differed substantially between the Sydney and Melbourne fires, our NWAI index performs well.
In this contribution we will discuss the (i) the principles of the NWAI and (ii) its potential for pollution risk forecasting.