Geophysical Research Abstracts
Vol. 20, EGU2018-15508, 2018
EGU General Assembly 2018

Short-term recovery of in-situ soil respiration with time-since-wildfire in maritime pine forest in Central Portugal

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Wildfires are recognized as a natural phenomenon in Mediterranean regions and play an important role in the evolution of the ecosystems. Wildfires not only have a significant direct impact on the carbon pool of terrestrial ecosystems by directly releasing carbon (C) into the atmosphere via biomass combustion but also have indirect effects by altering main carbon fluxes such as photosynthesis and soil respiration. Soil respiration (RS) is the second largest contributor to terrestrial-atmosphere carbon fluxes and is the sum of autotrophic respiration from plants metabolic activity and heterotrophic respiration from the decomposition of organic material by microbes. Soil respiration reflects the level of microbial activity and provides an indication of the ability of soils to support plant growth.
In this study, we compared changes in soil respiration with time-since-fire in a maritime plantation that was burnt during mid-August 2017 with changes in a nearby unburnt but otherwise comparable plantation. To this end, in situ measurements were carried out with a LiCor 8100 at 1- to 2-weekly intervals from early September 2017 onwards, also depending on the occurrence of rainfall. In the burnt plantation, a total of 20 measurements were done as each occasion, equally divided over four structural units, i.e. near pine trees without and with spontaneous post-fire needle cast, near shrubs and in bare inter-patches. In the burnt plantation, a total of 15 measurements were done at each occasion, i.e. near pine trees, neat shrubs and in inter-patches.
Preliminary analysis of the results suggested that soil respiration in the burnt and unburnt plantation tended to be quite similar and that it also did not differ markedly between the structural units at either of the two sites. Overall, soil respiration tended to be low, except for one peak that occurred shortly after the first rainfall event following the wildfire. This suggested that soil moisture content was the main limiting factor during the first 4 months after the wildfire, also reflecting the extended and increasingly strong-to-extreme drought period since the end of 2016 2017. Soil respiration is expected to remain low until early spring, in spite of considerable rainfall from mid December 2017 onwards, due to comparatively low temperatures.