



Project acronym: FINDBC

Project title: Fate of dissolved black carbon after fire disturbances in boreal forest ecosystems in Finland

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Discipline: Earth Sciences & Environment: Ecosystems & Biodiversity

Station(s): Värriö Subarctic Research Station (Finland), Hyytiälä Forest Research Station (SMEAR II) (Finland)

Nearly 1% of boreal forests are lost by fire every year. The black carbons produced by forest fire are mineralised slowly and thereafter dissolved into water. Since global warming may result in a change of dissolved black carbon, it is urgent to clarify the behavior of black carbon in forest soil after fire disturbance. The aims of this project are to study (1) the formation and decomposition process of dissolved black carbon in boreal soil and (2) the mineralization of dissolved black carbon on soil fertilization in boreal forests.

In Finland, several research sites have been established since for understanding the impact of fire disturbance on forest carbon cycling. The research sites include the fire chronosequence site in Värriö in Finnish Lapland and charcoal dispersal sites and fire treatment sites in Hyytiälä in southern Finland. Therefore, the proposed project is linked to the ongoing projects in Värriö and Hyytiälä in Finland. Our research team is specialists of the chemical analysis of the behavior of natural organic materials. Using the chemical analysis, we expect to clarify the formation and transition of black carbon after fire disturbance at the molecular level.

We will collect soil and soil water samples in the chronosequence sites in Värriö and the biochar treatment sites in Hyytiälä. The soil and water samples are transported to Japan. For the aim (1), chemical structures of soil organic materials determined by NMR are compared between the burned and forest sites. The mass spectra of FT-ICR-MS/ICR-MS-TOF were analyzed to categorize the molecules into function groups including black carbon. For the aim (2), molecular diversity of dissolved black carbon and the formation of minerals (N, P, S) determined with FT-ICR-MS/ICR-MS-TOF and ion chromatography, respectively. Then, they are compared among the chronosequence sites and between the treatment and control sites.