



Fate and transport of fire-born particles in subsurface systems

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A large amount of hazardous substances may be formed during fire extinguishing operations, depending of the location, type, and place of the fire. As a result, the fire-extinguishing water may act as a carrier for these nano- and micro-sized particles and various types of associated contaminants and may cause contamination of soil and groundwater resources. While airborne particles from fires have been more studied, it is currently not well known what types of nano- and micro-sized contaminants are typically carried by the fire-extinguishing water and how these contaminants can be transported in the natural environment. The main purpose of this study was to increase the understanding about the occurrence and physical and chemical properties of nanoparticles commonly found in discharge water from fire extinguishing operations. This is needed to further investigate how the properties of the particles affect their waterborne transport under various conditions in the second stage of this project. The study was based on collection of original samples from fire locations. A detailed characterization of the particles found in the extinguishing water was performed and included both quantification of contaminants associated with the particles such as metals and PAHs as well as measurements of properties related to the transportability of the particles in soil and groundwater systems, such as the particle-size distribution, particle surface charge, shape, structure, and presence of inorganic and organic compounds. Correlations between the presence of metal and PAH contaminants and particle size were examined. Ongoing column experiments are aimed at improving the understanding of the fate and transport of these fire-born particles and identifying the key properties governing their subsurface mobility and ultimate fate.