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SPATIAL AND TEMPORAL VARIATIONS IN BLACK CARBON IN SNOW ALONG THE WASATCH FRONT

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Black carbon's absorptive effects contribute significantly to climate warming, with its processes found to be second only to carbon dioxide in climate forcing effectiveness (Bond et al., 2013). Black carbon, which is a product of incomplete combustion, can impact surface energy balance when deposited on snow by lowering snow reflectivity (albedo). Black carbon is deposited on snow via two mechanisms: 1) dry deposition, where air pollutants are removed from the atmosphere via sedimentation and are deposited on the snow surface, and 2) wet deposition, where the snow falls as precipitation and dissolves particles into the water droplets. Analyzing the depositional and absorptive characteristics of black carbon could help to understand changing snowmelt patters, which is relevant for regional climate and hydrology in our changing climate (Skiles, 2017). The intent of this research project was to quantify the elevational gradients of black carbon in snow and assess the hydrologic and environmental impacts along the Wasatch Front, UT. Locally, the Salt Lake City area relies on the mountain snowpack to meet water demands, with more than 80% of surface water supply coming from Wasatch Front snowmelt (Bardsley, 2013). With this dependence on water availability from snow, it is important to recognize and constrain black carbon's role in controlling snowmelt patterns. Samples were collected before and after precipitation events, during and after persistent cold air pools, after episodic dust events, and during snow melt. By measuring the mass of refractory black carbon that is optically sensible by Single Particle Soot Photometer (SP2) laser-induced incandescence, the concentration of black carbon in main watersheds along the Wasatch Front was determined. Black carbon concentrations were higher in snow located at lower elevations that are closer to the urban center of Salt Lake City. Black carbon concentrations were also found to be higher in older snow, where the black carbon had coalesced at the snow's surface.