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The 2018 heatwave and its implications on ozone induced damage on vegetation in a subarctic climate

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An increased occurrence of persistent heatwaves, as one possible future scenario, generates favorable conditions for the formation of ambient air ozone. Vegetation highly specialized to subarctic climate is vulnerable to rapid environmental changes inflicted by global warming and might become more susceptible to ozone in the future. Over large parts of Europe the summer 2018 had been extraordinarily hot and dry and caused large wildfires in northern Sweden in particular. This can be regarded as a test case for such a future scenario. In both 2018 and 2019, we have monitored ambient air ozone concentrations at the Norwegian Institute of Bioeconomy Research (NIBIO) Environment Centre Svanhovd in Northern Norway. Due to data acquisition problems, ozone concentrations for two weeks in July 2018 were missing from our record. We present a reconstruction based on probability density function with respect to the Swedish and Finnish atmospheric monitoring sites in the region. Over all, ozone concentrations did not differ significantly between the two years. While temperatures and global irradiance diverged significantly from multi annual mean, precipitation varied only to some extent. Coincidentally, we have observed ozone-induced visible injuries on clovers in the ozone garden at Svanhovd in 2018, but not in 2019. We investigate the difference in uptake of ozone using the DO3SE model, with respect to the typical vegetation (e.g., birch and conifers) at the location. We assess whether critical levels on POD1 for these species were breached. We find that an unadjusted transfer of currently used standard parameters and methods on ozone damage assessment (IPC Mapping Manual) to vegetation in the subarctics will result in an misinterpretation of POD1 values.