

Environmental effects of a rare rain event in the high Arctic

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Projections of future Arctic climate indicate an intensified hydrological cycle with more precipitation. This will have a number of implications for Arctic ecosystem processes, including glacier mass balance, river discharge and tundra ecosystem functioning. At the high Arctic Zackenberg Research Station, northeast Greenland, a comprehensive climate change and ecosystem monitoring programme has been running since 1996, covering glaciological, terrestrial, limnic and marine compartments (www.zackenberg.dk).

During 2015, we observed record high annual precipitation in Zackenberg. Almost one-quarter of the annual precipitation fell during a unique nine-day long rain event in August. This study focusses on various inter-related ecosystem processes affected by the exceptional rain event: Increased river discharge resulting in high transport of suspended sediments and dissolved organic carbon. Late summer soil wetting and prolonged reduction of incoming shortwave radiation altering the surface energy balance and decreasing ecosystem carbon uptake.

As precipitation is predicted to increase in the Arctic in near future, extreme rain events as the one observed in August 2015 in Zackenberg can be expected to become more frequent. As such, the environmental effects we observe and are able to quantify, constitute an important showcase for the response of Arctic ecosystems to climatic changes. It also demonstrates the importance of integrated, long-term environmental monitoring programmes in the Arctic.