



## **Warming and thawing trends of permafrost at high Arctic site (Bayelva, Spitsbergen) 1998 - 2017**

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Permafrost around the Arctic is warming and thawing. We report data from the high arctic research site Bayelva (78.551N; 11.571E) located close to Ny-Alesund. Data on meteorology, energy balance components and subsurface observations have been made for the last 20 years (1998-2017; Boike et al. 2017).

This study site is underlain by permafrost with current mean permafrost temperature of  $-2.8^{\circ}\text{C}$  and is seasonally snow-covered from October to May. Mean annual, summer and winter soil temperature data at all depths have been rising over the period of record with a warming trend of  $0.18 \pm 0.07^{\circ}\text{C}/\text{year}$  in active layer and top of permafrost. However, interannual to sub-decadal variability is evident in the data and results mostly from differences of the climate during the winter months. The modeled active layer thickness using the Stefan equation has increased continuously from about 1m in 1998 and is estimated to have surpassed 2 m in 2016.

The data show that snow ablation has started earlier, thus extending the snow free season, potentially resulting in more time for soil warming and deepening of active layer. The snow cover onset and ablation, as well as the thermo insulation properties of the snow cover, will be investigated together with active layer and permafrost variables (temperature, volumetric water content) for further understanding of the observed warming and deepening.

Boike, J., Juszak, I., Lange, S., Chadburn, S., Burke, E., Overduin, P. P., Roth, K., Ippisch, O., Bornemann, N., Stern, L., Gouttevin, I., Hauber, E., and Westermann, S.: A 20-year record (1998–2017) of permafrost, active layer, and meteorological conditions at a High Arctic permafrost research site (Bayelva, Spitsbergen): an opportunity to validate remote sensing data and land surface, snow, and permafrost models, *Earth Syst. Sci. Data Discuss.*, <https://doi.org/10.5194/essd-2017-100>, in review, 2017.