



An 18-year record (1998-2016) of permafrost soil temperature, soil water content, and meteorological data from a high Arctic permafrost site Bayelva (Svalbard)



Study site

The measurement field („Bayelva“ correspondent to the river) is located in the north-west of Spitsbergen Island (78.921°N and 11.826°E) at a height of 25 m a.s.l. and 2 km from the village Ny-Ålesund at the coast (Figure 1a-c). The site is part of the Bayelva river catchment and influenced by a typical high arctic climate.

Meteorological

- West ocean current warms this area
- Average air temperatures are -13 °C in January and +5 °C in July
- Annually precipitation of around 400 mm, mainly as snow (sep-may)
- Occurrence of strong winds can lead to snow drifts

Soil and vegetation

- Continuous permafrost reaches to a depth of 100 m
- Maximum thawing depth of ca. 1.5 m during summer
- Soil is mainly composed of rocks and partly of typical glacial sediments
- Texture is classified as mainly silty loam
- Approximately 60% vegetation cover
- Lower vascular plants, such as grasses, mosses or sedges

Data

The data records cover a period of 18 years and involves different climate, soil and snow parameters (Figure 2). Since 2012 the entire measurement instrumentation is equipped with 220 V power supply, which eliminates data losses. Data logging frequency depend on instrument, but recordings are at least hourly. In addition, all data are accessible via internet connection in a real-time transfer. A daily routine of data quality checks and data visualisation is implemented. All data (raw and processed) are stored in a database and can be used in near-real-time. Hourly pictures of the instrumented field are taken to observe snow depth and spatial variability of soil surface.

Data availability

The data can be downloaded from various data sharing platforms:

- GNT-P (Global Terrestrial Network for Permafrost) <http://gntpdatabase.org>
- CALM (Circumpolar Active Layer Monitoring)
- TSP (Thermal State of Permafrost)
- FLUXNET (European Fluxes Database Cluster) www.europe-fluxdata.eu
- PANGAEA (Data Publisher for Earth & Environmental Science) www.pangaea.de
- Or by request to Julia.Boike@awi.de

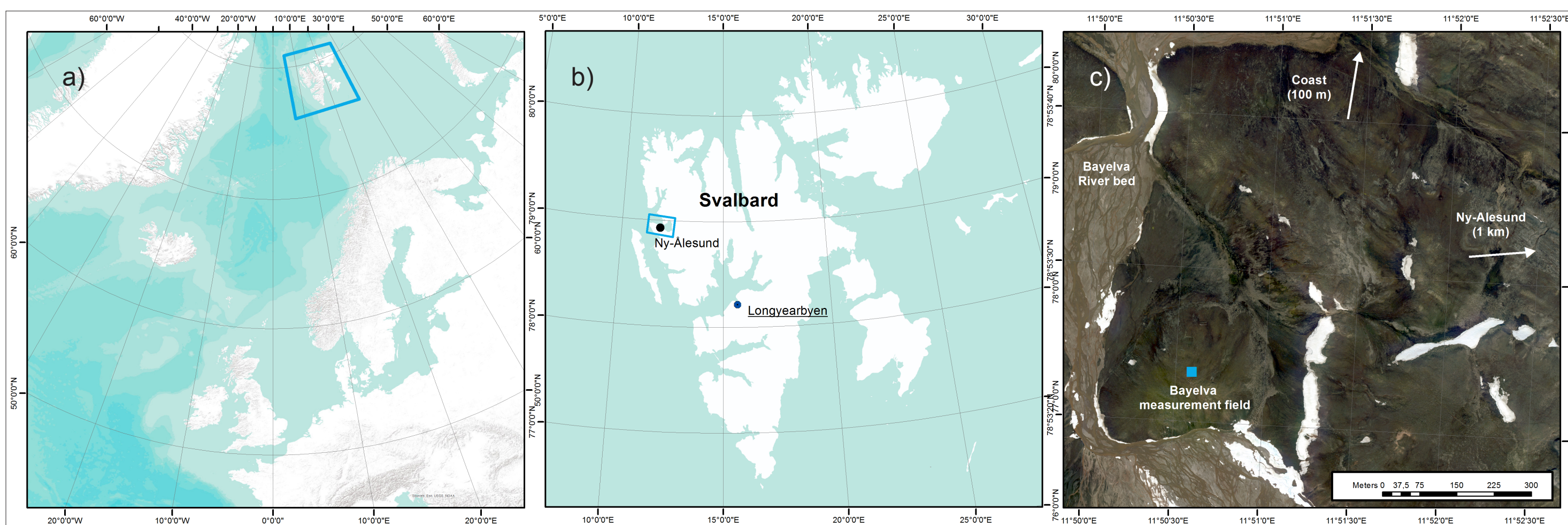


Figure 1: a) location of Svalbard b) location of study site close to the village Ny-Ålesund c) location of measurement field in the Bayelva river catchment.

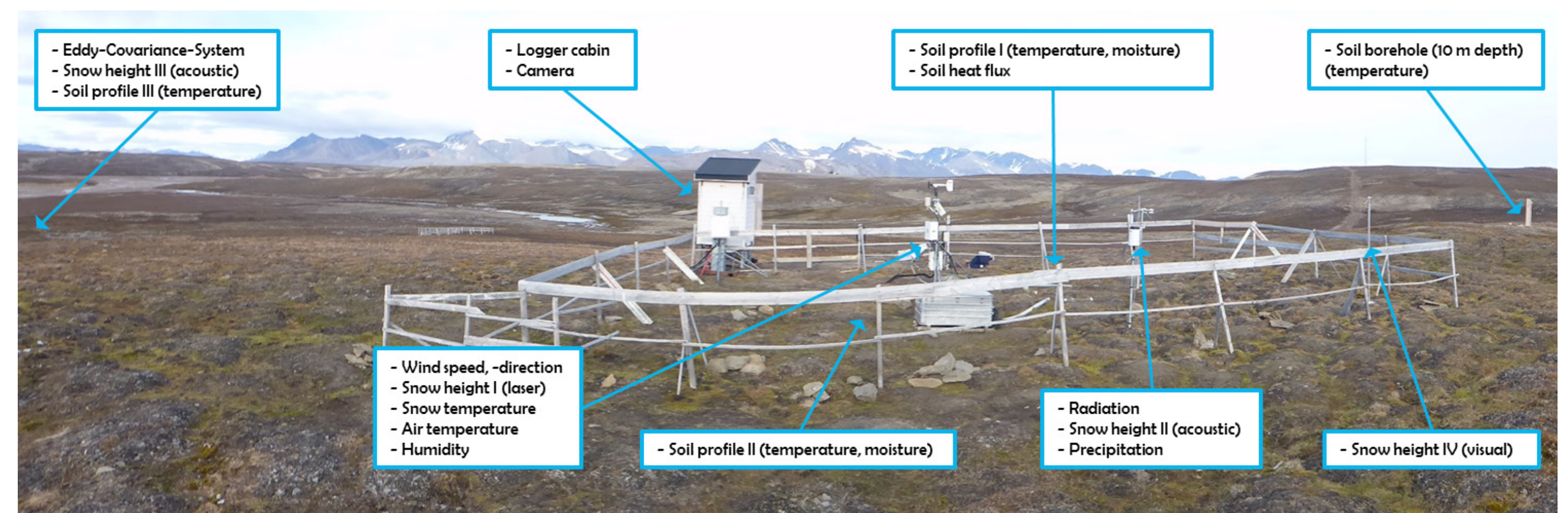


Figure 2: Bayelva measurement field with view to north-east, mountains in the background are on the other side of the fjord.

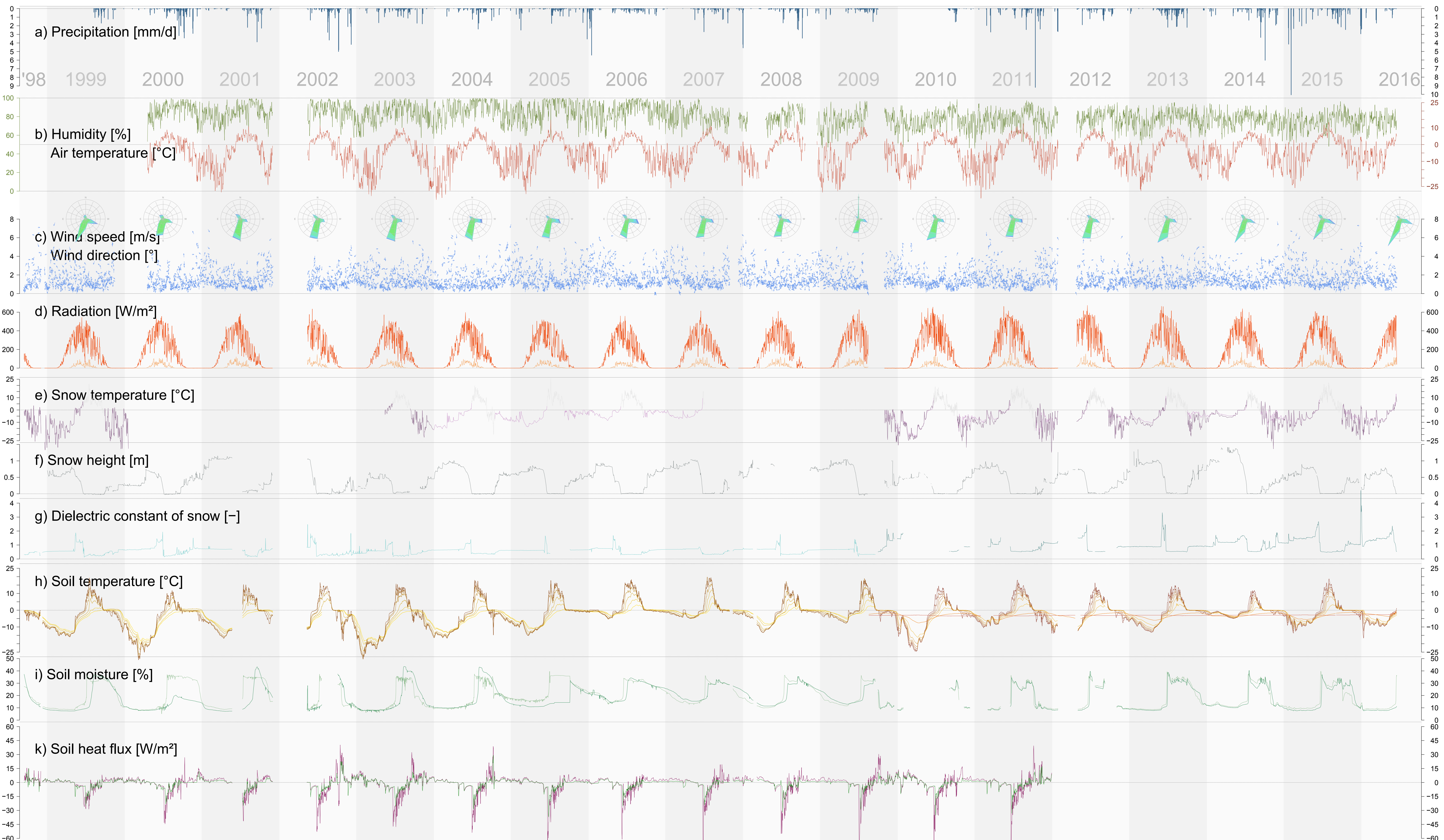


Figure 3: Time series of selected parameters recorded at the Bayelva measurement field: a) daily sum of precipitation, b) daily average of humidity and air temperature at 2 m height, c) daily average of wind speed and direction (blue arrows) and yearly average as a windrose (speed categories: 0-3, 3-6, 6-9, >9 m/s, green to blue), d) daily minimum and maximum of global radiation, e) average temperatures of snow at 0.04 and 0.20 m, no snow (grey), f) daily average of snow height, g) daily average of dielectric constant of snow, dark line after repositioning, h) daily average soil temperatures at -0.01, -0.11, -0.21, -0.37, -0.55, -0.71, -0.89, -1.41 m depth and repositioning in 2009 with additional borehole depths at -3.5 and -7.7 m, i) daily average of water content at -0.11 and -0.55 m depth, k) daily average of soil heat flux at bare (redwine) and vegetated (green) soil.