

### Stepwise sampling with steel rod (SR)

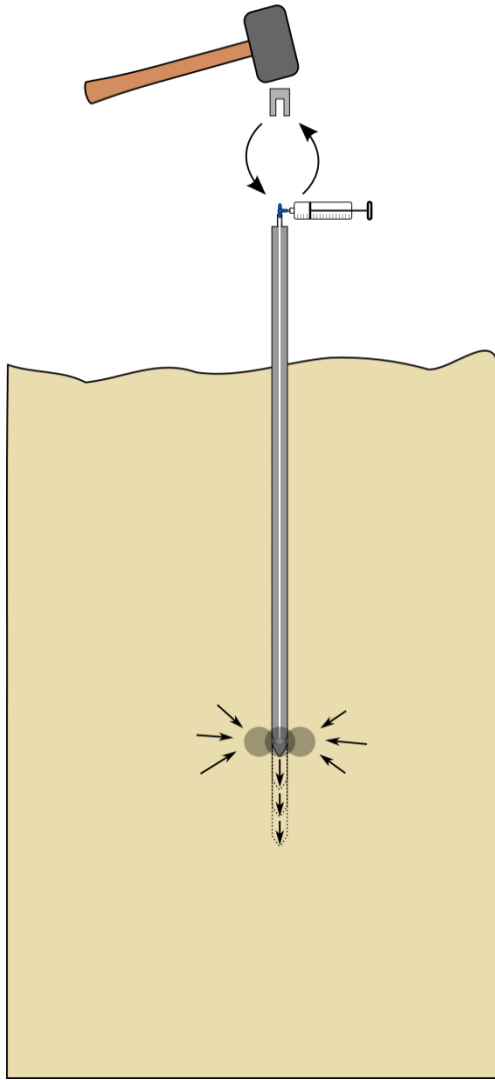


Fig. S1: Illustration of soil-gas sampling with the steel rod (SR). Samples are collected stepwise in user-defined depths; between sampling the rod is hammered further into the soil.

### Poly-use multi-level sampling system (PMLS)

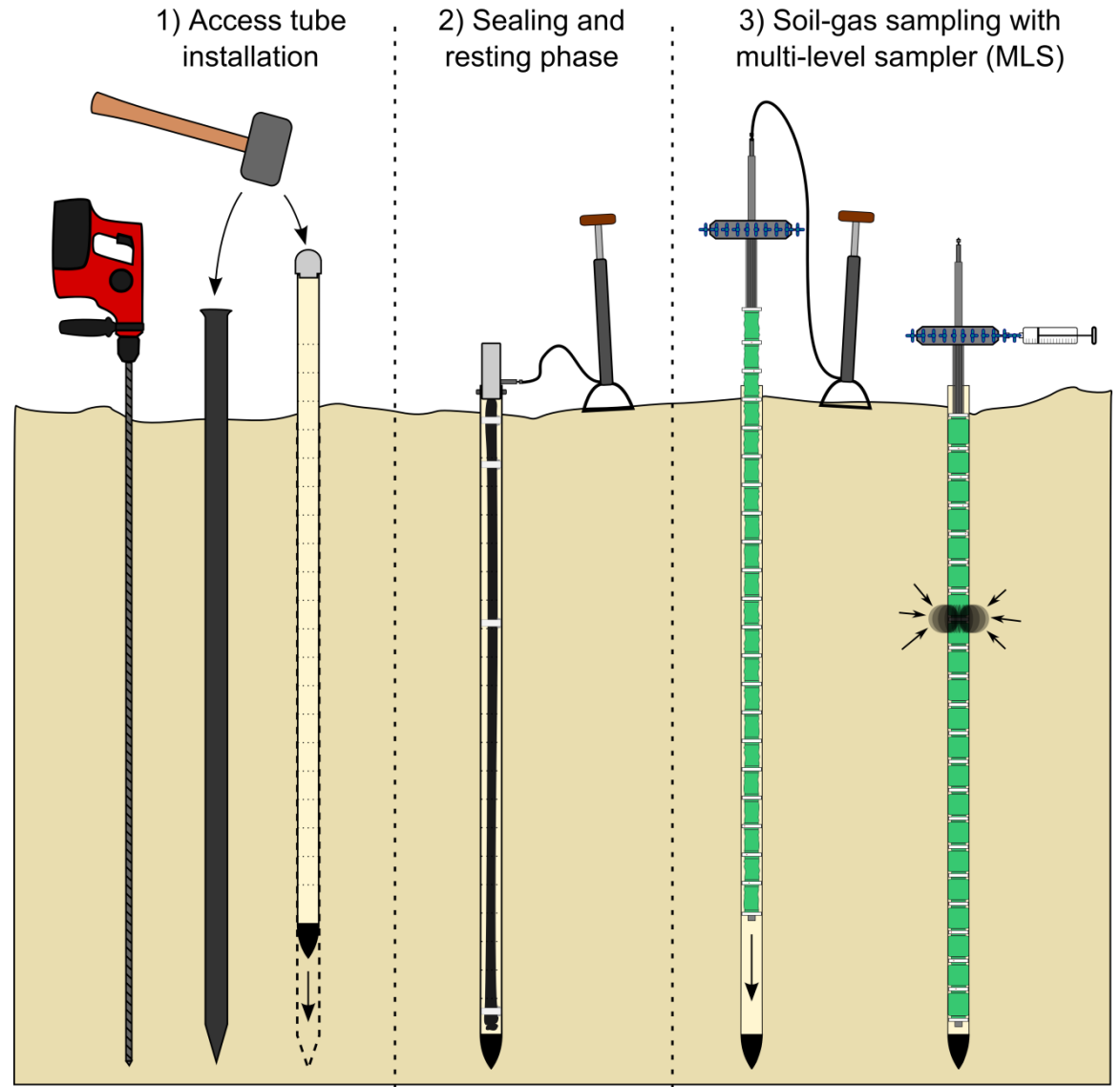


Fig. S2: Illustration of soil-gas sampling with the poly-use multi-level sampling system. 1) Permanent installation of a perforated access tube. 2) Sealing of the tube from the inside to prevent undesired gas exchange; a resting phase allows consolidation of the soil. 3) Soil-gas samples are taken through the walls of the access tubes at 20 defined depths with a MLS featuring an inflatable packer system.



Fig. S3: Picture of the SR in use in a siliceous glacier forefield.



Fig. S4: Pictures of the MLS. a). Full-length picture. b) Top-down picture showing the 20 sampling valves. c) Close-up picture with c) deflated and d) inflated packer membranes in a transparent tube.