



Tarfala Research Station (TRS) is located at 1135 m asl in the Kebnekaise Mountains, northern Sweden, and is run by Stockholm University. TRS welcomes scientists from all disciplines to conduct research in a unique arctic-alpine environment.

Annual report for Tarfala Research Station 2022

Director: Nina Kirchner

Vice director: Per Holmlund

Chair of the Board: Martin Jakobsson

Tarfala Research Station (TRS) is located at 1135 m asl in the Kebnekaise Mountains, in northern Sweden, and is hosted by the Department of Physical Geography (NG) at Stockholm University (SU). Inaugurated in 1961, TRS has supported research in the fields of glaciology and geomorphology since. Mass balance investigations on Storglaciären started in 1946 and continue today, rendering one of the World's longest and most detailed continuous glacier mass balance records. Over the years TRS has broadened its scope and now also focuses on ecosystems, biodiversity, hydrology, meteorology, climatology, archaeology and cultural geography to name but a few. TRS is open during two field seasons (spring and summer), and welcomes scientists from all disciplines to conduct research in this unique arctic-alpine environment.

Spring at Campus Frescati

In the beginning of the year, a new TRS strategical plan was decided on by the board. The strategic plan serves as a steering document for the long-term development of, and the organizational structure of, TRS and covers the period 2022–2026. The strategic plan is to be realized through a management and communication plan (2022-2023), which was also decided on during the spring.

The new international external advisory group was formalized during the spring and includes experts from natural and human sciences: Regine Hock (U Oslo/Norway), Tyrone Martinsson (U Gothenburg/Sweden), Sara Mollie Cohen (University Centre in Svalbard/Norway), Jason Box (GEUS, Denmark), Jon Moen (U Umeå/Sweden), Bjarne Grønnow (National Museum of Denmark) and Kari Anne Bråthen (U Tromsø/Norway).

In February a virtual TRS kick-off workshop was arranged, during which TRS was advertised to both national and international research colleagues. The kick-off also presented ongoing project and courses,

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suggestions and possibilities for field work as well as presentations of currently running research and long-term observational programs at TRS. Approximately 50 people attended.

Spring season at TRS

Difficult snow and weather conditions and a temporary flight ban in the Kebnekaise area (18/4–1/5) made the spring season at TRS complicated. Parts of the TRS staff was forced to start the field work season from Abisko Scientific Research Station, while other parts of the staff travelled up to TRS to open up the station for operation after the winter break. A fire safety inspection was carried out with good results in April by Kiruna municipality and a total of 51 guest nights were spent at TRS during the spring. This was less than originally booked since some groups had to cancel their visits due to the difficult weather.

Grants, conferences and ongoing MSc work

In April, director Nina Kirchner, together with interim operative station manager Annika Granebeck, received 1,8 MSEK from Formas to make research conducted at TRS more available, and to create a deeper understanding of climate change in the Arctic for non-scholars. During the year, Kirchner and Granebeck, together with Sami village representatives Sarri and Inga, also received 100 tkr from the Göran Gustafsson Foundation for a project on changing seasonality in the TRS area. Vice director Per Holmlund received 76 tkr from the Göran Gustafsson Foundation for ground truth surveys of the glaciers in the Swedish glacier front variation observation program reported to the WGMS. All four reference glaciers investigated regularly by TRS are included in the front variation program (which started in the 1960ies). The program also includes more than ten other Swedish glaciers, including Sálajiegna which – unlike others glaciers in the program – terminates with a ca. 1 km long calving front in a glacial lake.



The automatic weather station is being re-mounted by research engineer Barnett at Storglaciären after the winter break.

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In May, TRS was represented by Holmlund at The Swedish Climate symposium in Norrköping with both a talk and a poster. Later in the year, TRS was also represented by Granebeck with a poster on the annual Bolin Days in Aula Magna in November. Also in November, Kirchner presented TRS at the Arctic Seminar, held at the University of New Hampshire, USA, under the framework of the NSF-funded CARPE (Convergent Arctic Research Perspectives and Education) program.

Two MSc theses and one BSc thesis at NG/SU with relation to TRS were started in 2022. One of the MSc thesis focuses on applying modern methodology to the TRS glacier front variation program, and the other on quantifying margin change at the calving front of Sálajiegna glacier by repeat-mapping of the glacier front from autonomous surface vehicles. The BSc thesis focuses on uncertainty in mass balance calculations. All three are supervised by Kirchner, and the students are expected to complete their work in the late spring of 2023.

Summer season at TRS

The summer season started in late June, with duties ranging from glacier safety, first aid exercises and practicing emergency routines, to station and equipment inspection and maintenance, as well as general logistics. Field assistants and kitchen staffs complemented the permanent staff and supported a wide range of TRS projects and data collection programs and around the station and in the wider Tarfala area.

Open House days for non-scholars were arranged throughout the summer season and attracted approximately 100 persons. These were foremost tourists and staff from STF Kebnekaise Mountain Station, who got to meet TRS' researchers and learn more about the research carried out from TRS as a base.



TRS team working on lake Tarfala in late August.

Through the INTERACT program, TRS welcomed two research groups from the UK. International guest also included Profs. Julie Bryce and Ruth Varner from the University of New Hampshire, USA, who

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through their funded project “ICE TALKS - International Collaborative Experiences to Track Arctic LaKe Systems” could bring four undergraduate student and a PhD Student to TRS for a longer stay in July.

In August a student group of 25 persons came from Germany. The “Tarfala summer course” (official name as in the curriculum: Glaciers and high alpine environments) which NG has been arranging for many years now, had to be put on hold during the pandemic but was back this summer with a total of 14 students and three teachers. Smaller research groups from SU, KTH, Lund University as well as a larger group from the Swedish Armed Forces also used TRS’s facilities during the summer.



TRS team on their way to measure Sydtoppen in September.

High water flows, election helicopter and Sydtoppen

In august, the trail along Darfáljohka partially eroded after days of high-water flows, impacting the accessibility for hikes to and from TRS. Three larger sections of the trail above the first bridge were completely washed away, taking away a total stretch of a few hundred meters of the trail. Power line poles were also affected. The damaged sections are to be repaired during the summer of 2023.

Measurements of the elevation of Sweden’s formerly highest peak, Kebnekaise Southtop (Sydtoppen), were conducted on September 9, 2022. The peak continues to be lower than that of the northern peak. However, in contrast to reports on extreme glacier mass loss in the Alps, glacier mass loss in Sweden was moderate during the summer of 2022, and the elevation of the peak was measured as 2094.6 m asl, i.e., the same height as measured in 2021. The measurement generated – as always – considerable

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national and international media attention, and is available, together with measurements from previous years, though the Bolin Centre Database, <https://bolin.su.se/data/tarfala-sydtoppen-elevation-2>.

Since 2022 was election year in Sweden, the Swedish state sent an election helicopter to Kebnekaise mountain station in early September. All staff at TRS, with Swedish voting rights, got the opportunity to vote in the Sweden's parliamentary elections through this initiative.

Fall at Campus Frescati

The superintendent position at TRS was discontinued as a result of the reorganization of TRS, and a new position, operational station manager, was instead established and became an employment at NG. In November Annika Granebeck was employed as the operational station manager.

On November 18, the first annual TRS Day took place as a hybrid-format workshop at SU, with co-funding from the Section of Earth and Environmental Science at Stockholm University. The TRS Day will from now on be an annual workshop which presents reports from projects conducted at TRS during the ongoing year. The aim is to create an arena where researchers, students and teachers can exchange ideas, share experiences, find new inspiration and discuss possibilities to conduct field work at TRS and its surroundings. Approximately 65 people attended, including members of the external scientific advisory board.

Accessibility of data from TRS

During the fall, TRS and the Bolin Centre Database joined forces to make more of TRS' data on glaciers available through the Bolin Centre database. This was, among others, inspired by work published by leaders in the field, Geibel et al., [ESSD - Rescue and homogenization of 140 years of glacier mass balance data in Switzerland \(copernicus.org\)](https://www.copernicus.org/publications/10.5194/gmd-14-2019-2019). At SU, a structure and workflow were developed in close collaboration (Moberg and Mohammed/Bolin Centre Database, Kirchner and Barnett/TRS) and put into practice and applied to Riukojetna glacier as a pilot case by I. Rehn, a former NG student and field assistant at TRS. Another MSc student from NG was employed to prepare four datasets from Lake Tarfala for publication in the Bolin Centre Database. All datasets will be published after addition of visually attractive elements exemplifying the data, and after final quality checks (pending).

SITES, media and directors of TRS

SITES II funding period expired 20211231. SU/TRS and SITES agreed that SU/TRS declined continued involvement in SITES III which begins 20230101. The agreement was reached by consensus between the

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parties, who have expressed interest in continued cooperation in other forms where possible and desirable.

Towards the end of the year a longer reportage about TRS was published in the magazine Sveriges Natur: <https://www.sverigesnatur.org/natur/forskning-pa-hog-niva/>. Other media appearances of TRS during 2022 was in P4 Norrbotten: <https://sverigesradio.se/artikel/varmebolja-i-soder-8-grader-i-tarfala>, in Studio Ett: <https://sverigesradio.se/avsnitt/studio-ett-28-juli--2>, and in Finnish Hufvudstadsbladet, ["Inte en dag utan underställ" på hela sommaren – därför retirerade Kebnekaises sydtopp inte i år \(hbl.fi\)](#). TRS keeps an internal record of all media appearances (with support from SUs communication group, despite this it is however likely incomplete), which we are happy to share upon request.

The assignment period for TRS director and vice director expired 31/12 2022. SU chancellor decided to appoint Nina Kirchner as director for the period 20230101–20261231 and we extend our thanks to Per Holmlund, who served as vice-director during 2021-2022. We also wish TRS research engineer Jamie Barnett good luck with his PhD which he started in the fall of 2021 at the Dept. of Geological Sciences at SU. Barnett will continue to support TRS as research engineer during 10% of his time in the coming three years.

TRS publication list

A list of publications with relation to TRS is kept at <https://www.su.se/tarfala-research-station/research/publications-connected-to-tarfala-1.612589>. We do our best to keep this list up to date, but appreciate any help that we can get. Please let us know if we have missed an article and we will add it promptly!



The final picture of the year. TRS summer team have just closed down the station and are starting their final hike down to Nikkalukota Sep 17.

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TRS 2022 in numbers	
Nights spent at TRS, of which 50 % by guests and rest by staff	1457
Approved funding applications	3 pc, total of 1.92 msek
Submitted funding applied	12 pc, total of 14.6 msek
Open House Days at TRS	3 pc
TRS workshops and conferences	2 pc
TRS representation on other conferences/events	3 pc
Published datasets https://bolin.su.se/data/tarfala-sydtoppen-elevation-2 https://bolin.su.se/data/schytt-mannerfelt-2022-marma-dem-1 https://bolin.su.se/data/schytt-mannerfelt-2022-marma-geodetic-1 https://bolin.su.se/data/schytt-mannerfelt-2022-marma-outlines-1	4 pc

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