

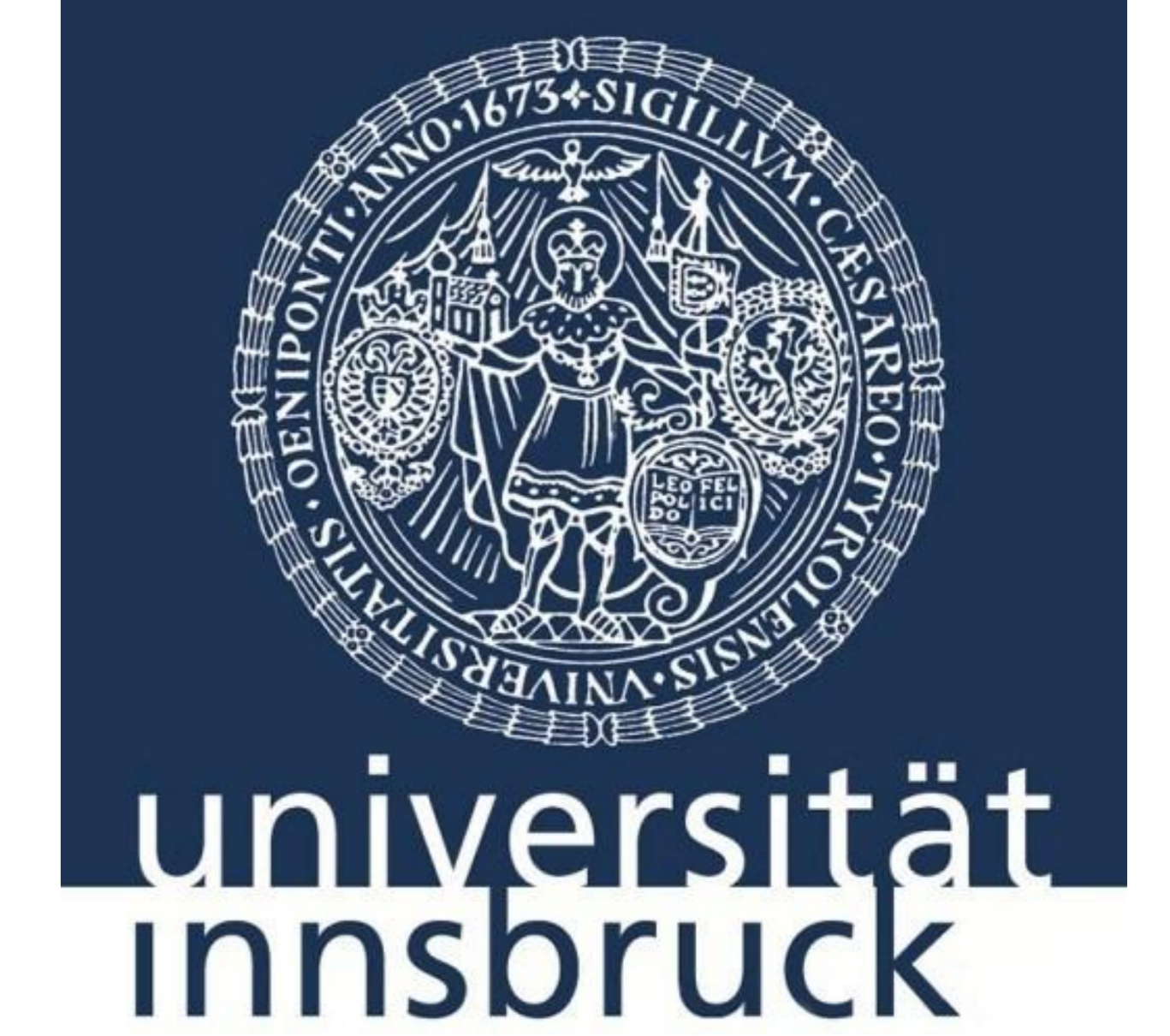


Estimating surface meltwater input to the ocean over the last 40 years from King George Island ice cap, Antarctica

Christian Torres¹; Wolfgang Gurgiser²; Jorge Arigony-Neto¹

¹Institute of Oceanography, Universidade Federal do Rio Grande, Brazil

²Department of Atmospheric and Cryospheric Sciences, University of Innsbruck, Austria



1. Introduction:

In the last four decades South Shetland Islands (SSI), located in Antarctica, have experienced statistically significant warming (1970-1998, +0.27 °C/dec.) and cooling (1999-2015; -0.69 °C/dec.) trends (see Fig. 1) (e.g., Turner et al., 2020).

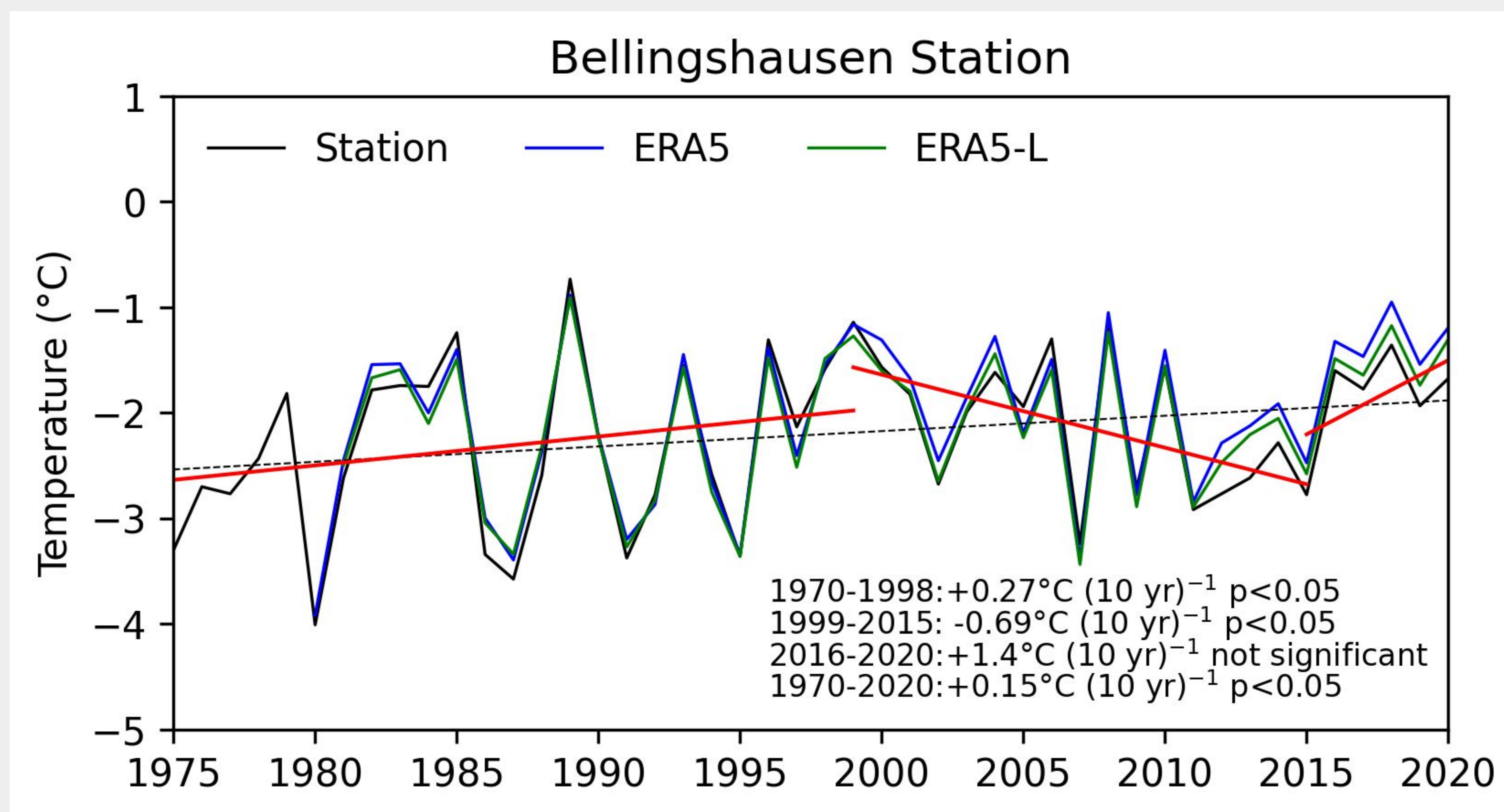


Figure 1. Annual mean air temperature at Bellingshausen Research Station for 1975-2020 period. Source SCAR READER database.

2. Motivation:

Glacier mass balance has been positive some years in two glaciers (see Fig. 2) on the SSI. However it is not well-known if the temperature changes are sufficient to accelerate and decelerate mass loss and runoff glaciers in this region.

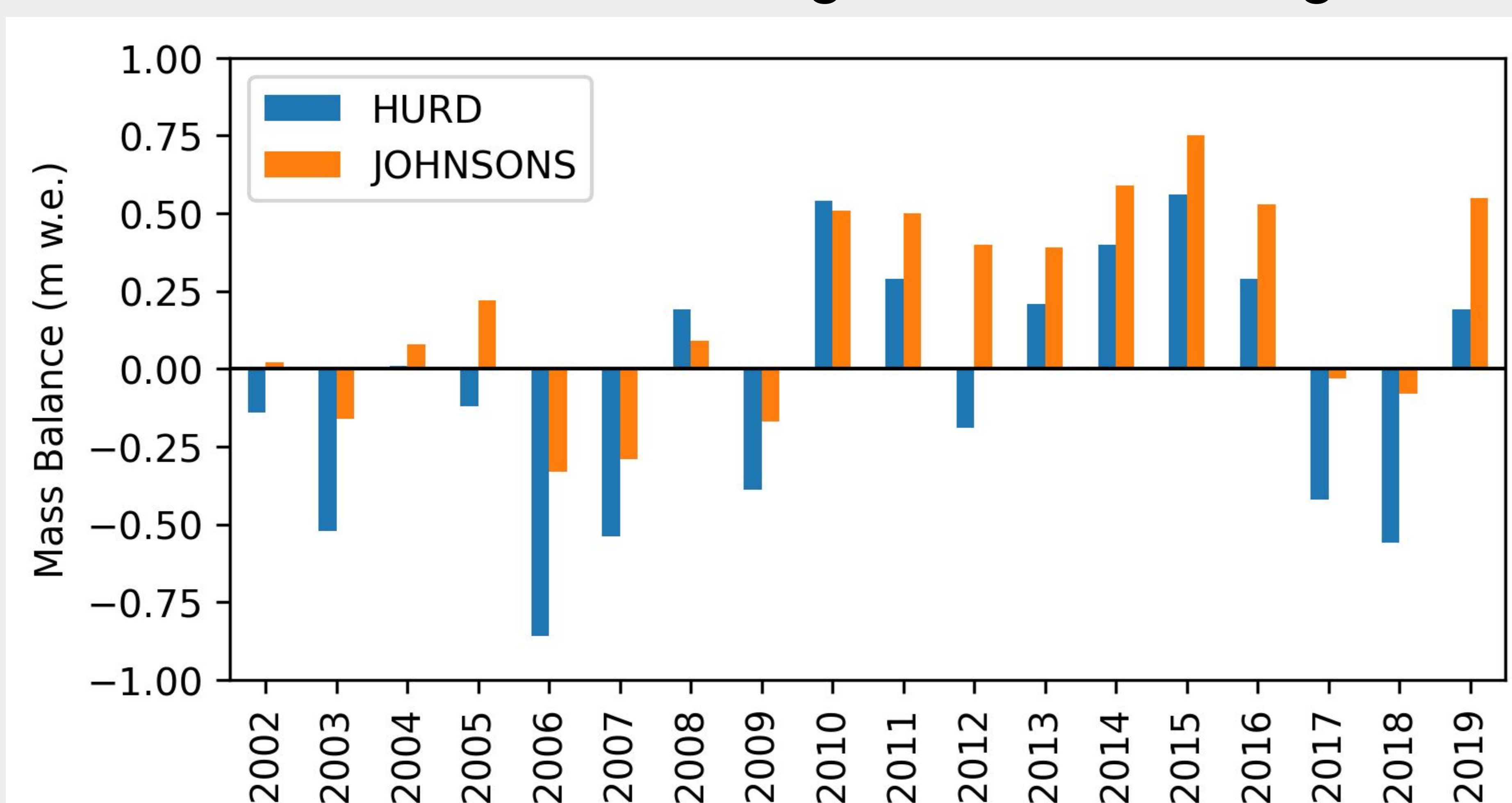


Figure 2. Annual mean surface mass balance at Hurd and Johnsons glaciers for 2002-2019 period. Source WGMS database.

3. Methods:

- COSIPY model (Fig. 3) to estimate mass balance and runoff.
- ERA5 reanalysis and satellite dataset.
- Polar-WRF model to downscaling climate data.

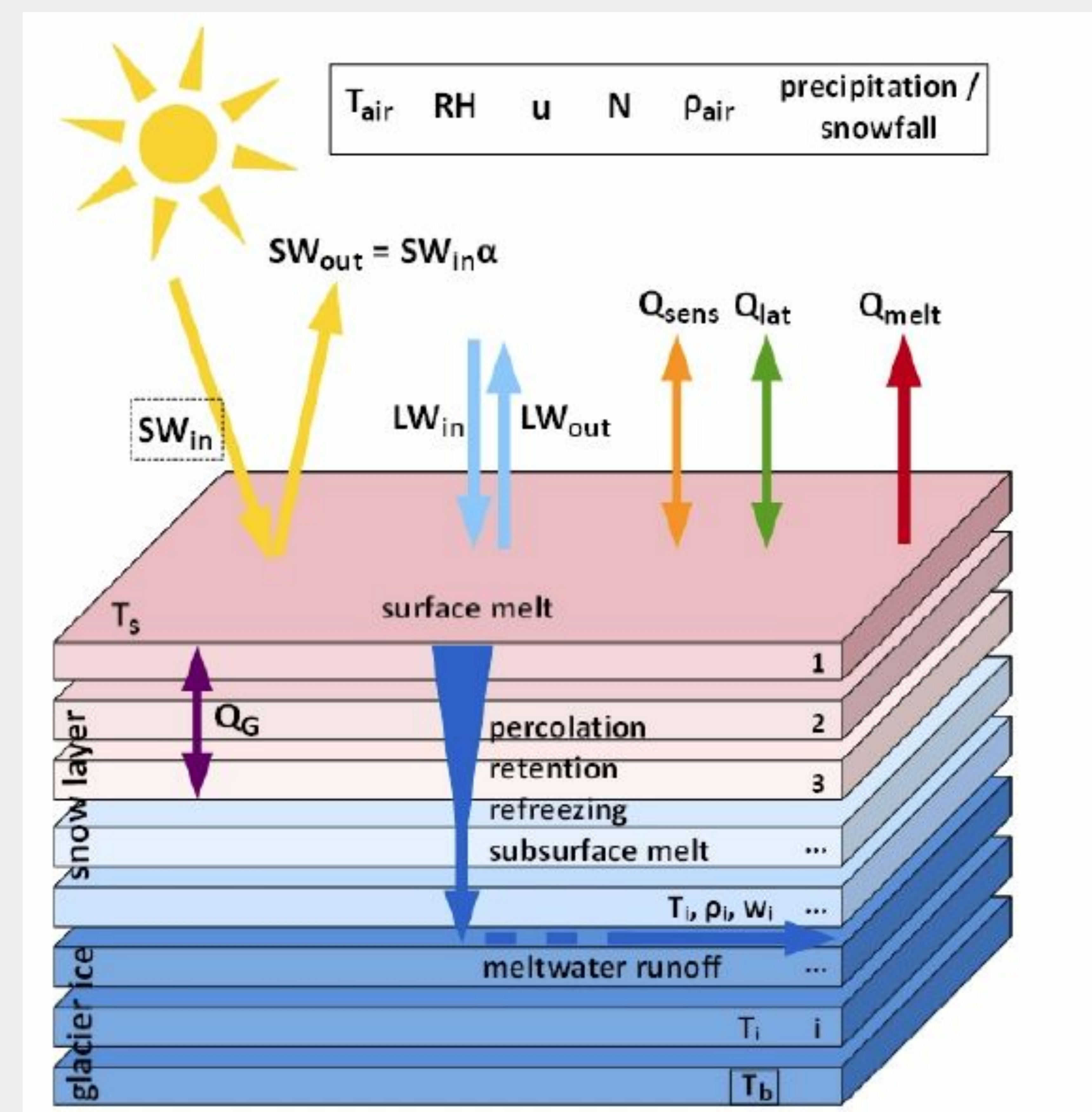


Figure 3. Illustration of a surface energy balance including a multi-layer snow/ice model. Source Huintjes (2014, PhD Thesis).

4. Results:

- Analysis of temporal variability and trends mass balance and runoff over the last 40 years.
- Evaluation oceanic and atmospheric influences.

5. Acknowledgements:

This research is supported by Peruvian and Brazilian Antarctic Programs and Brazilian Ministry of Education through CAPES scholarships.

6. References:

- Huintjes, E., (2014). Energy and mass balance modelling for glaciers on the Tibetan Plateau: Extension, validation and application of a coupled snow and energy balance model. PhD Thesis. RWTH Aachen University.
- Turner, J., Marshall, G. J., Clem, K., Colwell, S., Phillips, T., and Lu, H. (2020). Antarctic temperature variability and change from station data. International Journal of Climatology (Vol. 40, Issue 6, pp. 2986–3007).