M U N I

COMMENTARY TO HABILITATION THESIS[1]

Active Layer Thermal Regime and Thickness in Antarctica

Filip Hrbáček

Preface

This thesis summarizes my research activities on topic of active layer thermal regime and thickness which I conducted over past decade on James Ross Island and other regions of Antarctica. My research activities on James Ross Island can be divided into two phases. The initial stage of my research (2015-2020) was focused on identifying the interactions between the active layer and factors like climate conditions (air temperature, snow cover), lithology, and vegetation. These findings were published as a set of case studies (Papers 1-6), which provided the foundation for further research directions. Since 2020, our research has shifted to focus more on long-term data evaluation, modelling, and a complex understanding of the effects of soil physics on the active layer thermal regimes (Papers 7-12). Thanks to international collaboration with scientists working in other parts of Antarctica, we were able to utilize our results from James Ross Island and interpret them more thoroughly, drawing from data and knowledge from other Antarctic regions (Papers 13-16). The aim of this thesis is to provide comprehensive summary of following 16 scientific papers which documents the best my research on active layer thermal regime and dynamics in Antarctica

[1][2] Hrbáček, F., Láska, K., Engel, Z., (2016): Effect of snow cover on the active-layer thermal regime – a case study from James Ross Island, Antarctic Peninsula. Permafrost and Periglacial Processes, 27(3), 307–315. https://doi.org/10.1002/ppp.1871

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
70	20	70	60

[2] Hrbáček, F., Oliva, M., Laska, K., Ruiz-Fernández, J., de Pablo, M. A., Vieira, G., Ramos, M., & Nývlt, D. (2016). Active layer thermal regime in two climatically contrasted sites of the Antarctic Peninsula region. Cuadernos de Investigación Geográfica, 42(2), 457–474. https://doi.org/10.18172/cig.2915.

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
90	40	75	50

[1] The commentary must correspond to standard expectations in the field and must include a brief characteristic of the investigated matter, objectives of the work, employed methodologies, obtained results and, in case of co-authored works, a passage characterising the applicant's contribution in terms of both quality and content.
[2] Bibliographic record of a published scientific result, which is part of the habilitation thesis.

[3] Hrbáček, F., Nývlt, D., Láska, K., (2017): Active Layer Thermal Dynamics at Two lithologically Different Sites on James Ross Island, Eastern Antarctic Peninsula. Catena, 149(2), 592–602. https://doi.org/10.1016/j.catena.2016.06.020

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
90	50	60	70

[4] Hrbáček, F., Kňažková, M., Nývlt, D., Láska, K., Mueller, C.W., Ondruch, J., (2017): Active layer monitoring at CALM-S site near J.G. Mendel Station, James Ross Island, eastern Antarctic Peninsula. Science of the Total Environment, 601, 987-997. http://dx.doi.org/10.1016/j.scitotenv.2017.05.266

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
75	50	75	80

[5] Kňažková, M., Hrbáček, F., Kavan, J., & Nývlt, D. (2020). Effect of hyaloclastite breccia boulders on meso-scale periglacial-aeolian landsystem in semi-arid Antarctic environment, James Ross Island, Antarctic Peninsula. Cuadernos de Investigación Geográfica, 46(1), 7–31. https://doi.org/10.18172/cig.3800

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
30	10	20	40

[6] Hrbáček, F., Cannone, N., Kňažková, M., Malfasi, F., Convey, P., Guglielmin, M., (2020): Effect of climate and moss vegetation on ground surface temperature and the active layer among different biogeographical regions in Antarctica. Catena, 190, 104562. https://doi.org/10.1016/j.catena.2020.104562

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
35	40	60	50

[7] Hrbáček, F., Uxa, T., 2020. The evolution of a near-surface ground thermal regime and modeled active-layer thickness on James Ross Island, Eastern Antarctic Peninsula, in 2006-2016. Permafrost and Periglacial Processes, 31(1), 141–155. https://doi.org/10.1002/ppp.2018A

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
50	50	50	50

[8] Hrbáček, F., Engel, Z., Kňažková, M., Smolíková, J. (2021). Effect of summer snow cover on the active layer thermal regime and thickness on CALM-S JGM site, James Ross Island, eastern Antarctic Peninsula. Catena, 207, 105608. https://doi.org/10.1016/j.catena.2021.105608 Author contribution: 45 % (writing, concept, data analysis, fieldwork)

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
50	50	50	50

[9] Hrbáček, F., Kňažková, M., Farzamian, M., Baptista, J. (2023). Variability of soil moisture on three sites in the Northern Antarctic Peninsula in 2022/23. Czech Polar Reports, 13 (1), 10 – 23. https://doi.org/10.5817/CPR2023-1-2

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
75	75	40	75

[10] Kňažková, M., Hrbáček, F. (2024). Interannual variability of soil thermal conductivity and moisture on the Abernethy Flats (James Ross Island) during thawing seasons 2015-2023. Catena, 234, 107640, https://doi.org/10.1016/j.catena.2023.107640

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
15	50	15	50

[11] Kaplan Pastírikova, L., Hrbáček, F., Uxa, T., Láska, K. (2023). Permafrost table temperature and active layer thickness variability on James Ross Island, Antarctic Peninsula, in 2004–2021. Science of the Total Environment, 869, 161690. http://dx.doi.org/10.1016/j.scitotenv.2023.161690

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
10	60	10	60

[12] Hrbáček, F., Kňažková, M., Láska, K., Kaplan Pastíriková, L., (accepted). Active layer warming and thickening on CALM-S JGM, James Ross Island, in the period 2013/14–2022/23. Permafrost and Periglacial Processes. https://doi.org/10.1002/ppp.2274

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
75	80	60	75

[13] Hrbáček, F., Oliva. M., Ruiz-Fernández, J., Kňažková, M., de Pablo, M.A. et al., (2020). Modelling ground thermal regime in bordering (dis)continuous permafrost environments. Environmental Research, 181, 108901. https://doi.org/10.1016/j.envres.2019.108901

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
75	80	60	80

[14] Obu, J., Westermann, S., Vieira, G., Abramov, A., Balks, M.R., Bartsch, A., Hrbáček, F., Kaab, A., Ramos, M., (2020): Pan-Antarctic map of near-surface permafrost temperatures at 1 km(2) scale. The Cryosphere, 14(2), 497 - 519. https://doi.org/10.5194/tc-14-497-2020

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
0	10	10	10

[15] Hrbáček, F., Vieira, G., Oliva, M., Balks, M., Guglielmin, M., de Pablo, M.A., Molina, A., Ramos, M., Goyanes, G., Meiklejohn, I., Abramov, A., Demidov, N., Fedorov-Davydov, D., Lupachev, A., Rivkina, E., Láska, K., Kňažková, M., Nývlt, D., Raffi, R.,Strelin, J., Sone, T., Fukui, K., Dolgikh, A., Zazovskaya, E., Mergelov, N., Osokin, N., Miamin, V., 2021. Active layer monitoring in Antarctica: an overview of results from 2006 to 2015. Polar Geography, 44 (3), 217–231. https://doi.org/10.1080/1088937X.2017.1420105

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)

60	30	70	50

[16] Hrbáček, F., Oliva, M., Hansen, C., Balks, M., O'Neill, T.A., de Pablo, M.A., Ponti, S., Ramos, M., Vieira, G., Abramov, A., Kaplan Pastíriková, L., Guglielmin, M., Goyanes, G., Francellino, M.R., Schaefer, C., Lacelle, D., 2023. Active layer and permafrost thermal regimes in the ice-free areas of Antarctica. Earth Science Reviews, 242, 104458. https://doi.org/10.1016/j.earscirev.2023.104458

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
40	80	25	80