



ASSW 2021 Science Conference – Call for Abstracts Extended to December 10th

Given the ongoing COVID-19 situation in Europe, North America and elsewhere, the ASSW2021 Local Organizing Committee (LOC) in coordination with IASC has made the decision to move the conference to an online event, with the possible exception of the business meetings that involve fewer participants. The Call for abstracts for the Science Conference is now extended to December 10. This will include several T-MOSAIC related symposia, including on indigenous methodologies, paleoclimate records in lake sediments, permafrost, contaminants, microbiology, Arctic infrastructure, and remote sensing: please check the meeting website for details: www.assw2021.pt



T-MOSAIC at the 1st Beijing Normal University Arctic Workshop

João Canário, T-MOSAIC chair, presented the project at the 1st Beijing Normal University Arctic Workshop on November 19th, 2020.

The workshop was organized by Dr. Xiaofan Yang, the Chinese representative at the IASC TWG. With this presentation we hope to bring more Chinese colleagues to our program.



SPECIAL ISSUES

Special T-MOSAIC Issue of Arctic Science

The T-MOSAIC special issue of “Arctic Science” is open for submissions until March 2022. Please visit the T-MOSAIC website for updated information or contact the secretariat: <https://www.t-mosaic.com/>



Special T-MOSAIc Issue on Arctic Terrestrial Pollution

The Environmental Pollution Journal (IF: 6.792) submissions will start at December 1st at the journal website. This special issue publication aims to provide original research on Arctic Terrestrial Pollution (including Coastal Areas).

This special issue will be edit by João Canário (University of Lisbon, Portugal), Katrin Vorkamp (Aarhus University, Denmark), Mark Mallory (University of Acadia, Canada) and Scott Zolkos (Woods Hole Research Center, USA).



PARTNERS

Arctic Change 2020 (AC2020)

Many T-MOSAIc contributions will be made at the upcoming AC2020, including in a plenary session involving MOSAIc and T-MOSAIc, and a multidisciplinary symposium on 'Northern Roads and Rail' organized by the Arctic Infrastructure AG. The organizers note: *"From 7 to 10th December 2020, Arctic Change will make history by going virtual for the first time ever. ArcticNet's international Arctic science conference takes place every 3 years, bringing together researchers and partners from around the world. This year, we're taking the conference to you! Building on the success of our previous Annual Scientific Meeting while facing the realities of our times, we are pulling out all the stops to reach a bigger audience than ever before. The registration deadline is December 3rd. Please visit the meeting website for more details: <https://arcticnetmeetings.ca/ac2020/home>."*



INTERACT

INTERACT –*The International Network for Research and Monitoring in the Arctic*– is seeking experts from various fields of research from natural sciences to human dimension to join an international pool of experts to help with the scientific evaluation of the INTERACT Transnational Access applications. Currently, experts are especially needed on topics such as land-based and air-borne contaminants and pollutants, genetics, geomorphology, microplastics, One Health and soil science. However,



scientists from other fields of research are also warmly invited to join the INTERACT Expert Pool. More information about this call [here](#).

ACTION GROUP ACTIVITIES

Remote Sensing AG

Aiming at addressing the needs, challenges and gaps on Arctic land-surface characterization, the Remote Sensing Action Group organized a session on 28 October at the ESA – EC European Polar Science Week 2020. Our summary and recommendations are presented below.

Arctic land-surface characterization: needs, challenges and gaps, T-MOSAIC.

Chair: Annett Bartsch | Rapporteur: Gonçalo Vieira

Summary: Arctic terrestrial environments are changing at fast pace due to climate change with permafrost degradation being core to the dynamics of the land surface. As such, the encompassing relevance of permafrost shows as cross-cutting in the five Research Needs recently identified in the Integrated European Polar Research Programme.

Remote sensing techniques supported by a well-planned strategy of field observations, feeding into modelling are key to the understanding of the new Arctic. Priority research areas include upscaling of carbon fluxes and pools, permafrost feature mapping and transition monitoring, proxies for subsurface conditions, biodiversity and landcover change, hydrological changes, socio-ecological systems, impacts on infrastructure, among others. One key environment that needs further investigation are permafrost coasts, bridging important terrestrial and marine ecosystems, home to Indigenous and local populations, settings of valuable infrastructure and pathways of new transport routes. Arctic coasts are key for the understanding of connectivity and gradients in the Arctic as recognized by the Terrestrial Multidisciplinary distributed Observatories for the Study of Arctic Connections Program (T-MOSAIC) of IASC. They are extremely dynamic areas and increasingly vulnerable to coastal erosion, caused by rapid warming and thawing of permafrost, as well as by changes in sea ice cover and associated exposure to waves and currents.



This session, promoted by the Remote Sensing Action Group of T-MOSAIC aimed at discussing (I) the more urgent needs to identify and quantify climate change impacts, (II) the needs to address subsurface conditions in the terrestrial Arctic, such as permafrost temperature, ice content and carbon in the soils, (III) the ways to collaboratively developing science and supporting Arctic communities.

The session started with five presentations, followed by a community discussion on future priorities for EO. A. Bartsch presented a synthesis on the new advances and initiatives on Arctic terrestrial remote sensing and remaining challenges. Numerous studies show potential of currently available data, but circumpolar implementation still needs to be done, for example related to coastal erosion and landcover. Further on, current solutions which are feasible circumpolar are at the limit of required spatial resolution. G. Grosse addressed the progress and gaps on quantifying and monitoring permafrost thaw with multi-decadal optical timeseries. He highlighted the needs for higher spatial and temporal resolution imagery to understand the tipping character of permafrost, to facilitate the access to VHR EO data as well as to high performance processing and storage platforms. I. Myers-Smith focused on the use of drones to bridge the gap between in situ and satellite observations, explaining the new advances on vegetation monitoring through the HiLDEN network and its relevance across scales, especially for addressing the need for a landscape perspective that is missed in many studies. M. Siewert presented a review on the status and challenges of detecting soil carbon from EO, emphasizing on the new applications of predictive modelling using machine learning. For improving soil carbon mapping, better integration of DEMs and multispectral data is needed, while scaling issues need to be tackled, since there are considerable differences on soil carbon estimates depending on resolution. T. Ingeman-Nielsen presented success examples of active layer monitoring based on Sentinel-1 for hazard assessment and infrastructure management in Greenland. He showed how remote sensing can contribute to improving engineering solutions at site-specific scale.

Conclusions and recommendations

Although local to regional applications of EO data for characterization of the natural environment do exist, circumpolar coverage with adequate resolution and quality is still lacking. The Sentinel-1 and -2 missions of the Copernicus program provide data with unprecedented detail. However,



the Arctic shows a complex 3D land mosaic, where the interactions between the subsurface and the surface phenomena, can only be understood through synergistical applications involving new tools and methods, from improved ground data collection (e.g. drones, community observations) to new modelling approaches including the use of machine learning and AI.

The following are the key recommendations from this session:

- Improve open access to very high spatial resolution imagery (to a minimum of ca. 50 cm) and continuously acquired imagery.
- Guarantee the future continuity of acquisitions (optical such as Landsat and Sentinel-2 as well as SAR) over northern permafrost regions.
- Ensure data from similar sensor configurations are acquired across the entire Arctic to facilitate mapping algorithm development and spatial intercomparisons.
- Facilitate the access to existing high-resolution commercial satellite data.
- Develop and consolidate drone-based protocols for extensive ground-truthing and improving the assessment of the quality and limitations of remote sensing products.
- Investigate scale-dependency of ecosystem properties.
- Support the creation of infrastructure and management system to promote the open access to drone data.
- Promote the synergistic use and integration of field observations and remote sensing data.
- Foster circumpolar implementation of monitoring schemes.
- Support early career researchers in projects and with relevant thematic training courses.



Permafrost Thaw AG

The Permafrost Thaw Action Group attended the annual meeting of PermafrostNet on Wednesday November 18 to represent T-MOSAIc. This NSERC network is led by Stephan Gruber and it was a very productive and well-organized meeting. We had several people attending our T-MOSAIc break out session with interest about our standardized protocol to measure permafrost thaw.

If you are interested in the protocol at your site (easy to use and specialist equipment not required), please contact us (contact details



are on the T-MOSAiC AG page). Soon a great mobile app for recording data will be released.

Arctic Microbiomes AG

The AG Arctic Microbiomes will host a session titled "Microbiomes and biogeochemical processes along geographic and environmental gradients in the circumpolar North " at the online Arctic Science Summit Week, 20-26 March _2021 (see above).

Session chairs: Jérôme Comte (IRNS, CA), Klemens Weisleitner (University of Innsbruck, Austria) and Anne D. Jungblut (Natural History Museum, UK). More information at <http://www.assw2021.pt>

The proposal "Last Ice Microbiomes" was endorsed by T-MOSAiC and involves collaboration with MOSAiC (AWI, Germany), GFZ (Germany), NIPR (Japan), DFO Canada, the Canadian Museum of Nature, Carleton University, University of Ottawa, and the Natural History Museum (London, U.K). It is led by Professor Alexander Culley at Laval University, Quebec City, Canada, and has now been funded by Sentinel North (CFREF, Canada) for the period 2021-2023. This T-MOSAiC group team has published a Perspectives in Science, available here: <https://science.sciencemag.org/content/370/6520/1031>



IASC

OTHER ARTICLES RELEVANT TO T-MOSAiC THEMES

-  Folhas, D., Duarte, A.C., Pilote, M., Vincent, W.F., Freitas, P., Vieira, G., Silva, A.M.S., Duarte, R.M.B.O., Canário, J., 2020. Structural Characterization of Dissolved Organic Matter in Permafrost Peatland Lakes. *Water*, 12, Art. 3059. <https://doi.org/10.3390/w12113059>.
-  Shakil, S., Tank, S.E., Kokelj, S.V., Vonk, J.E., Zolkos, S. Particulate dominance of organic carbon mobilization from thaw slumps on the Peel Plateau, NT: Quantification and implications for stream systems and permafrost carbon release. (2020). *Environmental Research Letters* 15(11), 114019. <https://iopscience.iop.org/article/10.1088/1748-9326/abac36>.
-  Wologo, E., Shakil, S., Zolkos, S., Textor, S., Ewing, S., Klassen, J., Spencer, R.G.M., Tank, S.E., Baker, M.A., O'Donnell, J.A., Wickland, K.P., Foks, S.S.W., Zarnetske, J.P., Lee-Cullin, J., Liu, F., Yang, Y., Kortelainen, P., Kolehmainen, J., Dean, J.F., Vonk, J.E., Holmes, R.M., Pinay, G., Powell,

- M.M., Howe, J., Frei, R., Abbott, B.W. Stream dissolved organic matter in permafrost regions shows surprising compositional similarities but negative priming and nutrient effects. *Glob. Biogeochem. Cycles*. <https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2020GB006719>.
-  Zolkos, S., Tank, S. E., Striegl, R. G., Kokelj, S. V., Kokoszka, J., Estop-Aragonés, C., and Olefeldt, D. 2020. Thermokarst amplifies fluvial inorganic carbon cycling and export across watershed scales on the Peel Plateau, Canada, *Biogeosciences*, 17, 5163–5182. <https://doi.org/10.5194/bg-17-5163-2020>.

