EGU General Assembly 2022

Vienna, Austria & Online | 23 May 2022
CL1.2.2 **EGU22-8756**

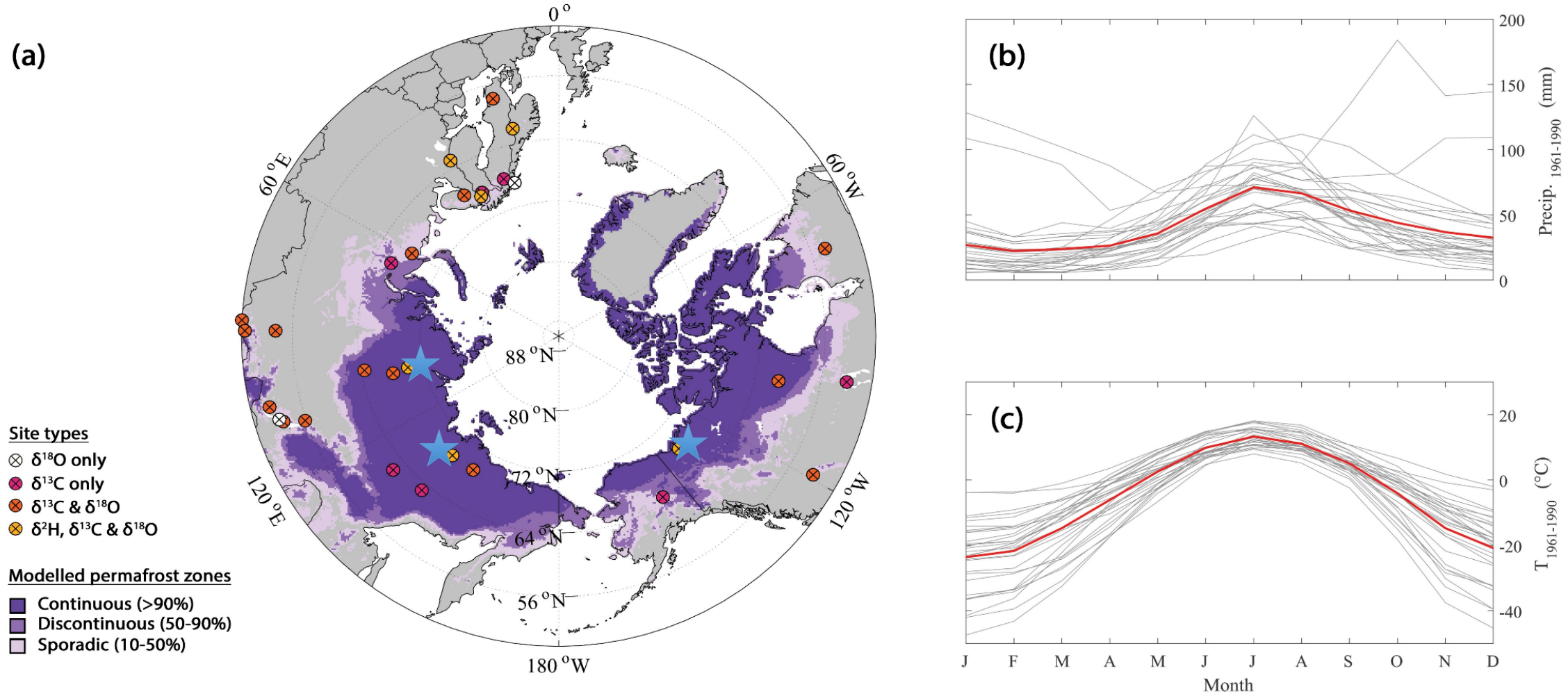
# TREE-RING STABLE ISOTOPES AND CLIMATIC PATTERNS FROM SIBERIAN TO CANADIAN SUBARCTIC

**Olga V. Churakova (Sidorova)**
Mikhail S. Zharkov, Marina V. Fonti, Tatyana V. Trushkina, Valentin V. Barinov, Anna V. Taynik, Trevor J. Porter, Alexander V. Kirdyanov, Alberto Arzac, Matthias Saurer

https://orcid.org/ 0000-0002-1687-1201
E-Mail: ochurakova@sfu-kras.ru


Photo Alberto Arzac

# STABLE CARBON, OXYGEN AND HYDROGEN ISOTOPES IN BOREAL TREE-RING CELLULOSE




Churakova (Sidorova) et al. 2022, ISBN 978-3-030-92697-7
*Stable Isotopes in Tree Rings of Boreal Forests*
Chapter 20, in Book Stable isotopes in tree-rings, Eds. Siegwolf RTW, Brooks R, Roden J, Saurer M.

# STABLE CARBON, OXYGEN AND HYDROGEN ISOTOPES IN TREE-RING CELLULOSE

Yakutia, Russia

YAK – 69-70°N, 139-148°E
*Larix cajanderi* Mayr.
Photo A. Arzack

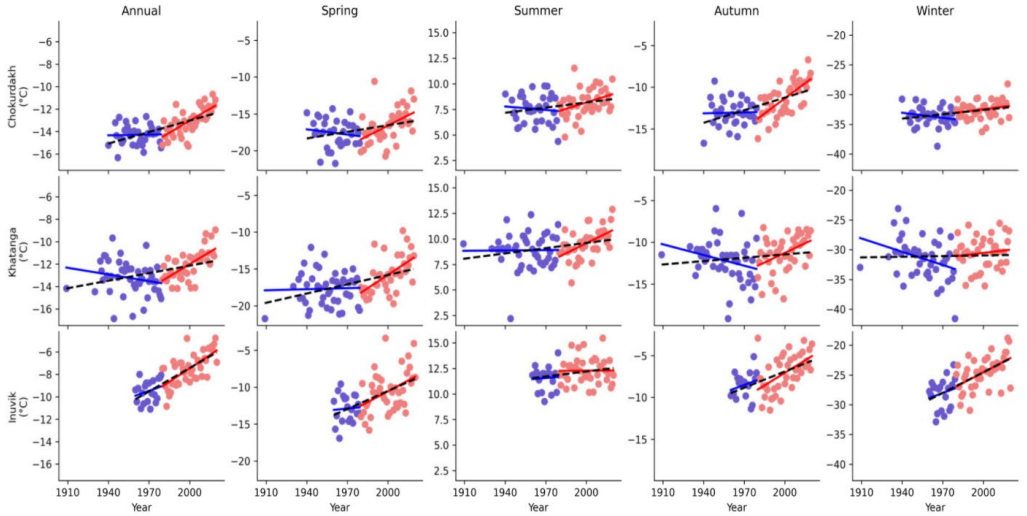
Taimyr Peninsula, Russia

TAY, 70°N, 102°E
*Larix gmelinii* Rupr.
Photo A. Bondarev

Mackenzie Delta, Canada

CAN, 68°N, 133°W
*Picea glauca (Moench)* Voss
Photo T. Porter

Air temperature (1961-2020)

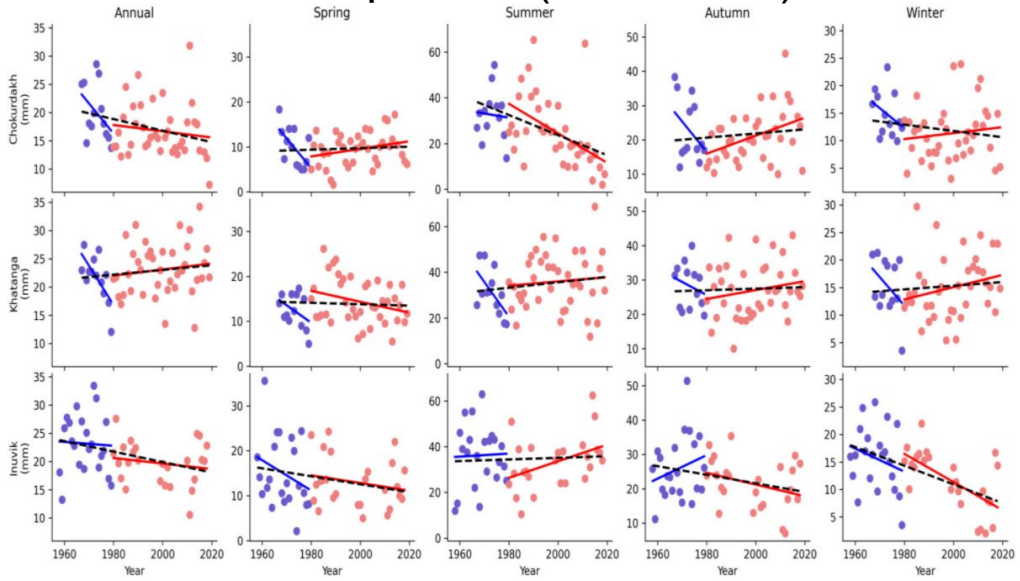



YAK
Chokurdakh

TAY
Khatanga

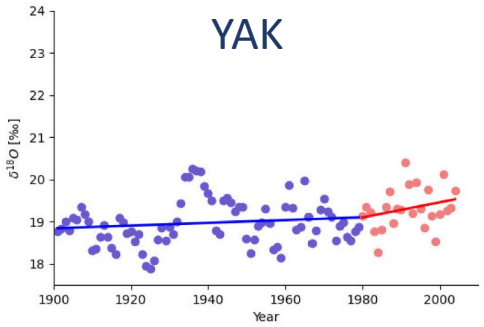
Inuvik
Canada

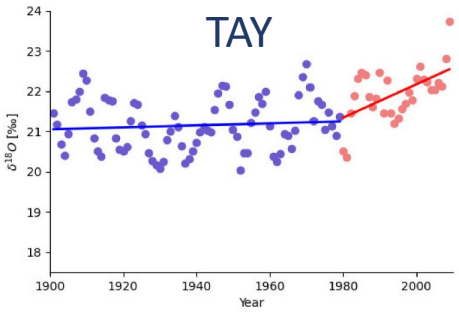
Precipitation (1961-2020)

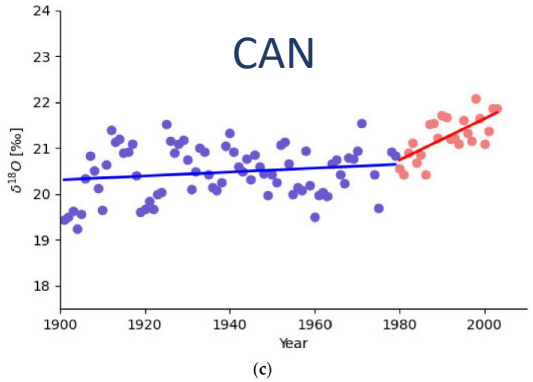



Zharkov et al. 2021
MDPI Atmosphere
https://doi.org/10.3390/atmos12111416

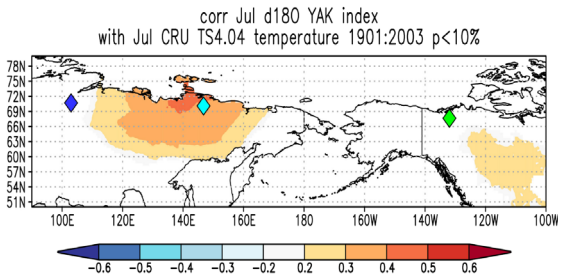
# TREE-RING $\delta^{18}O$ VERSUS GRIDDED CLIMATE DATA (1901-2003)

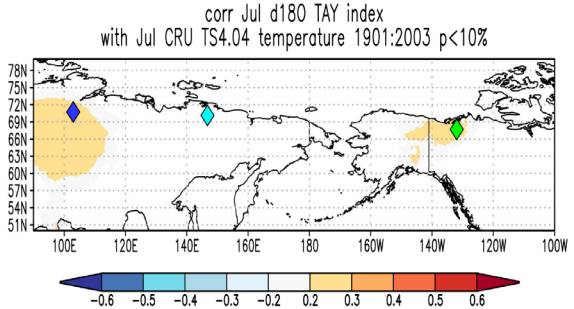


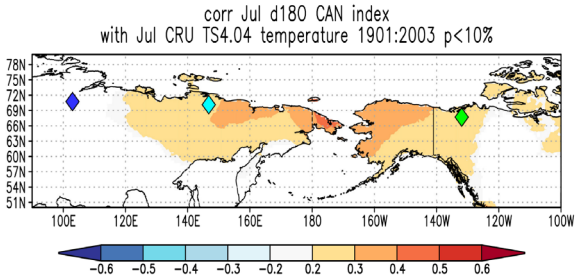



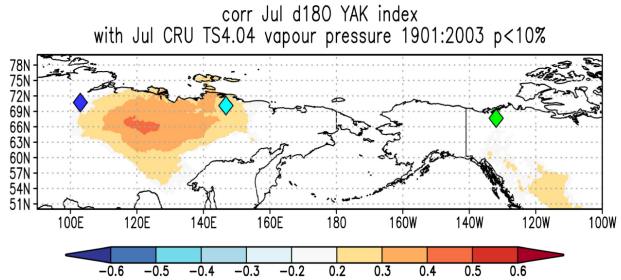

## July air temperature

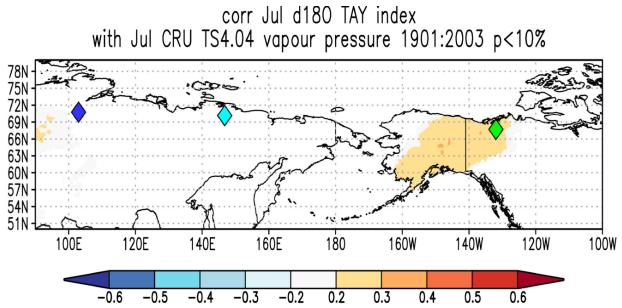


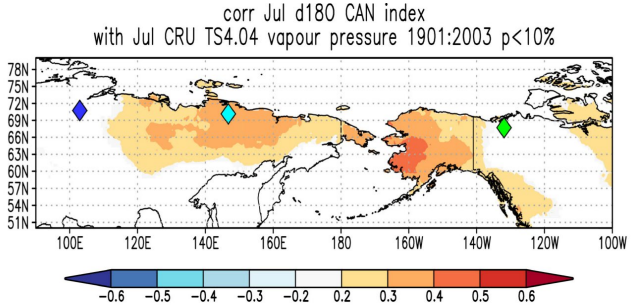



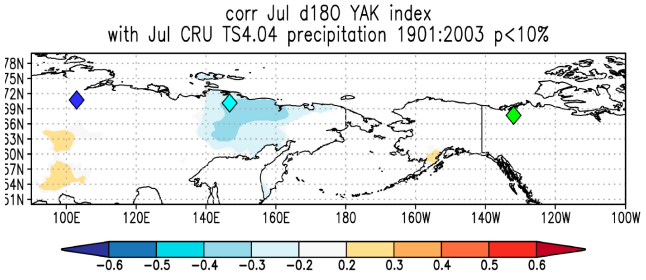

## July vapor pressure deficit

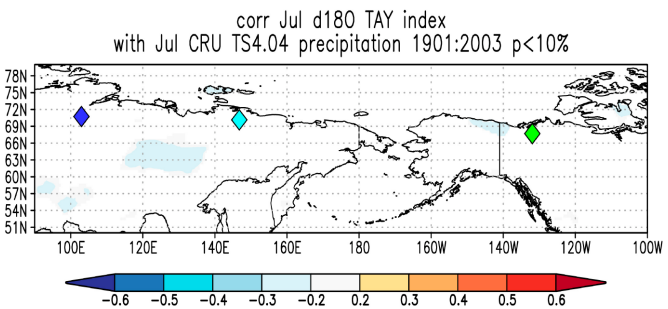


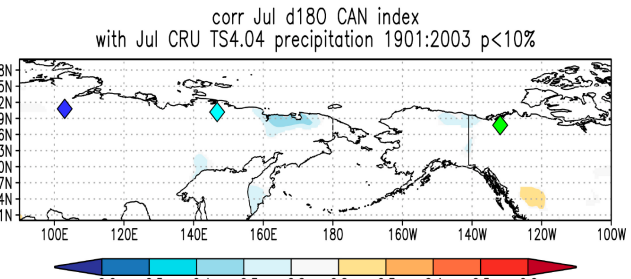




## July precipitation



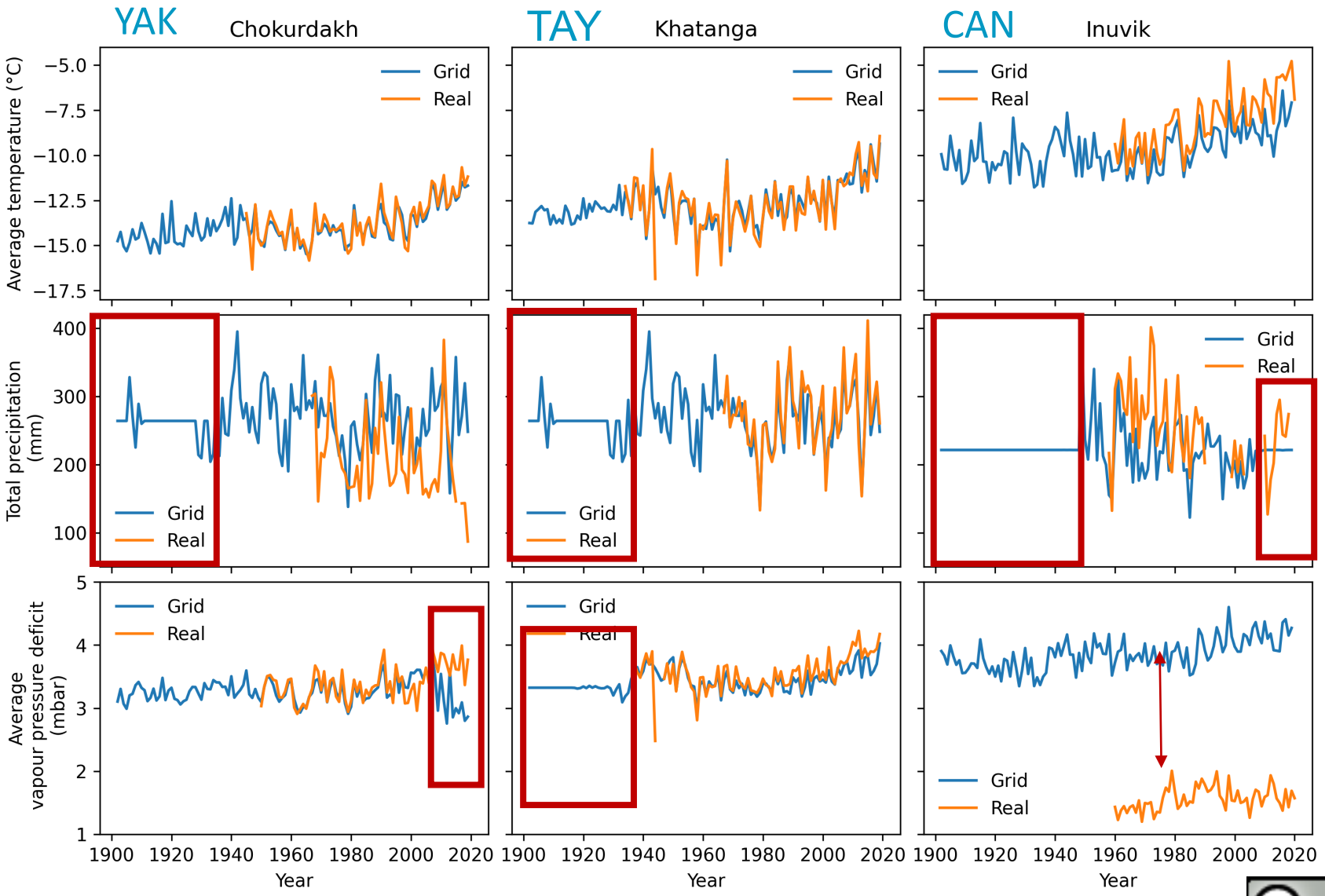



# ANNUAL GRIDDED 1901-2020 *CLIMEXP.* VERSUS LOCAL *METEO.RU* DATA

Air temperature 1939-2016
r = 0.90, p = 0.0001 (YAK)
r = 0.90, p = 0.0001 (TAY)
r = 0.92, p = 0.0001 (CAN)

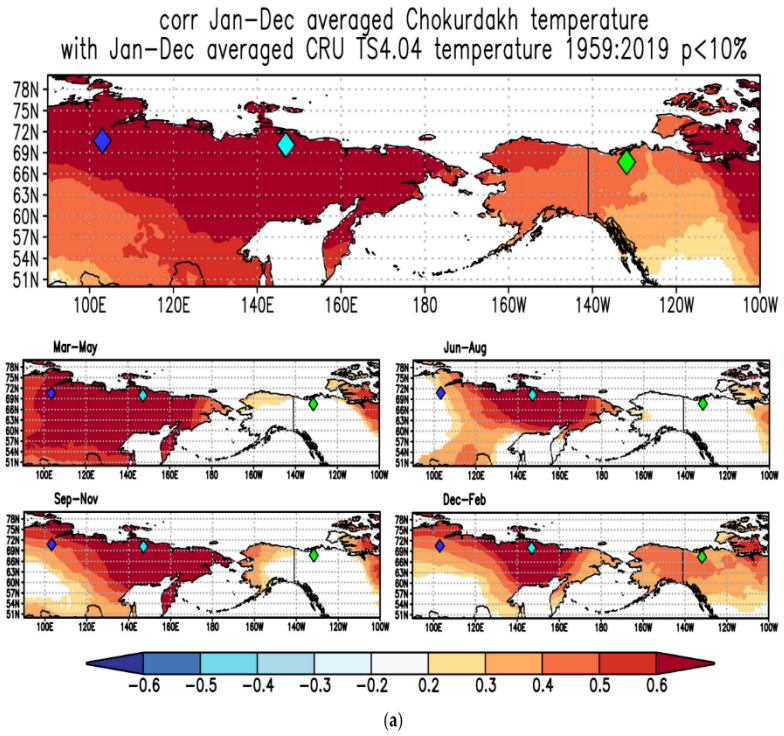
Precipitation 1966-2019
r = 0.21, p = 0.138 (YAK)
r = 0.92, p = 0.0001 (TAY)
r = 0.65, p = 0.0001 (CAN)

Vapor pressure deficit (VPD) 1940-2019
r = 0.34, p = 0.03 (YAK)
r = 0.75, p = 0.0001 (TAY)
r = 0.32, p = 0.01 (CAN)

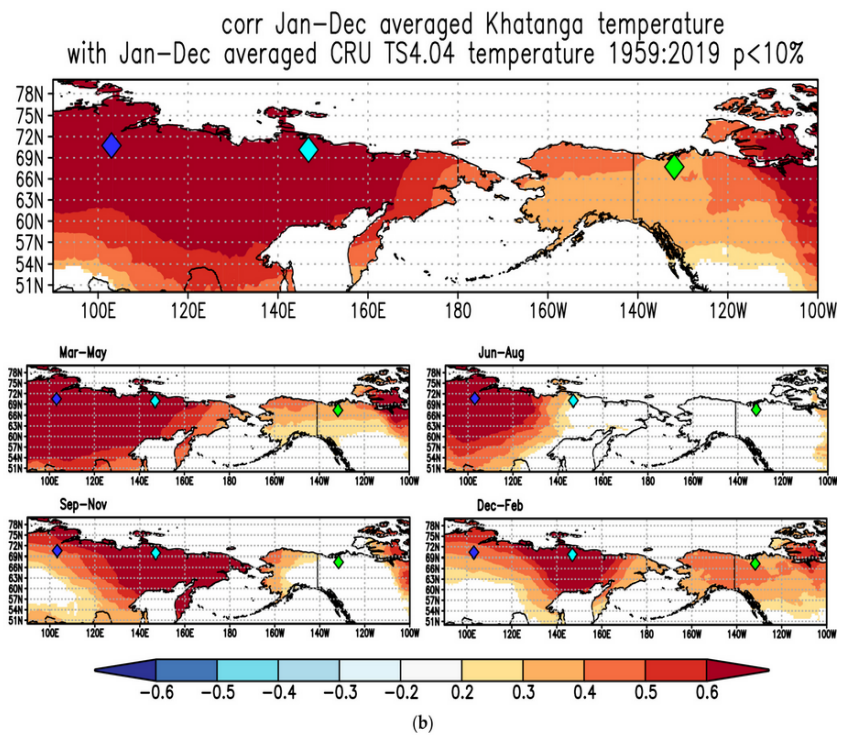


# SPATIAL DISTRIBUTION OF CORRELATION COEFFICIENTS BETWEEN GRIDDED AND LOCAL AIR TEMPERATURE

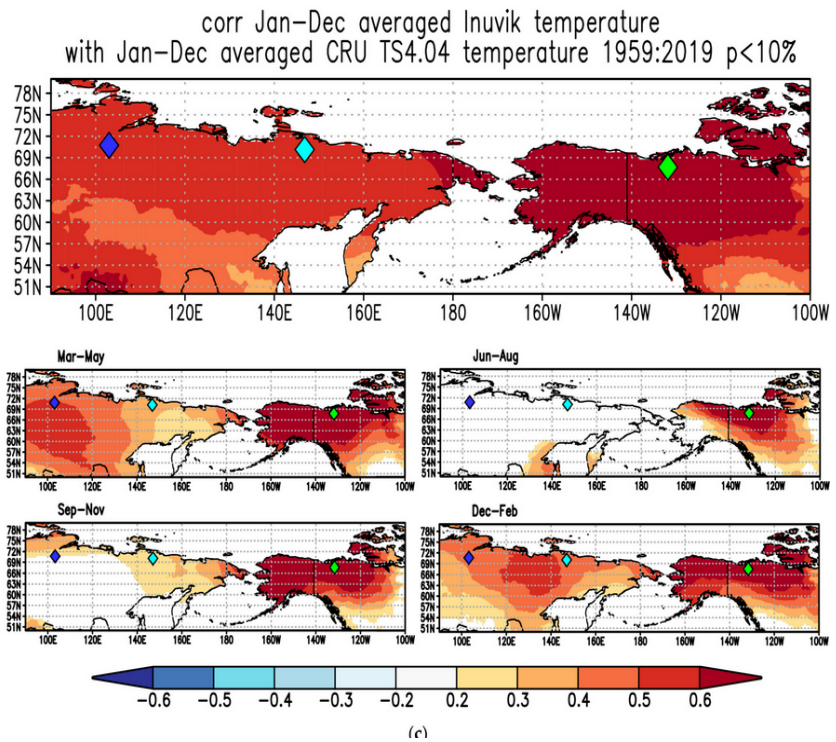
## YAK




## TAY

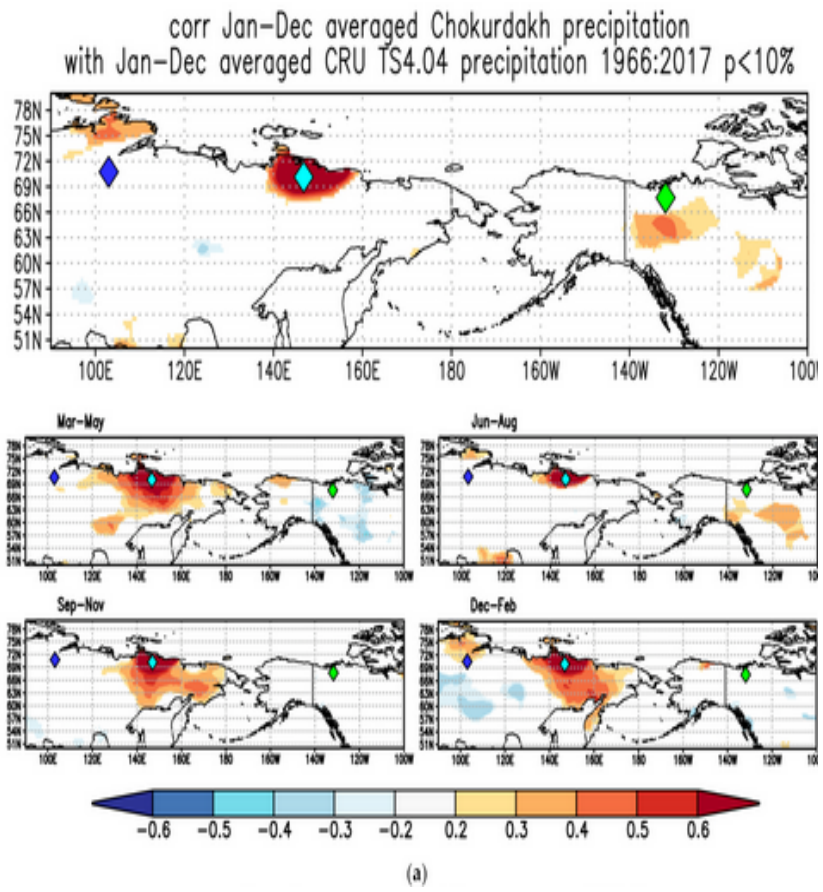



## CAN

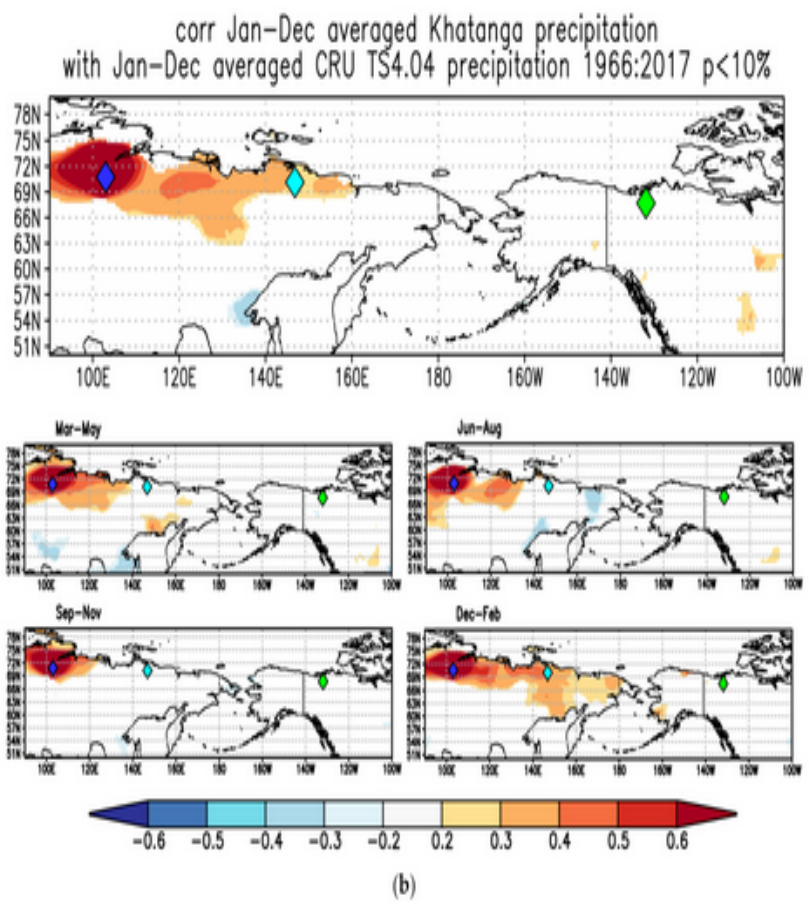


# SPATIAL DISTRIBUTION OF CORRELATION COEFFICIENTS BETWEEN GRIDDED AND LOCAL PRECIPITATION

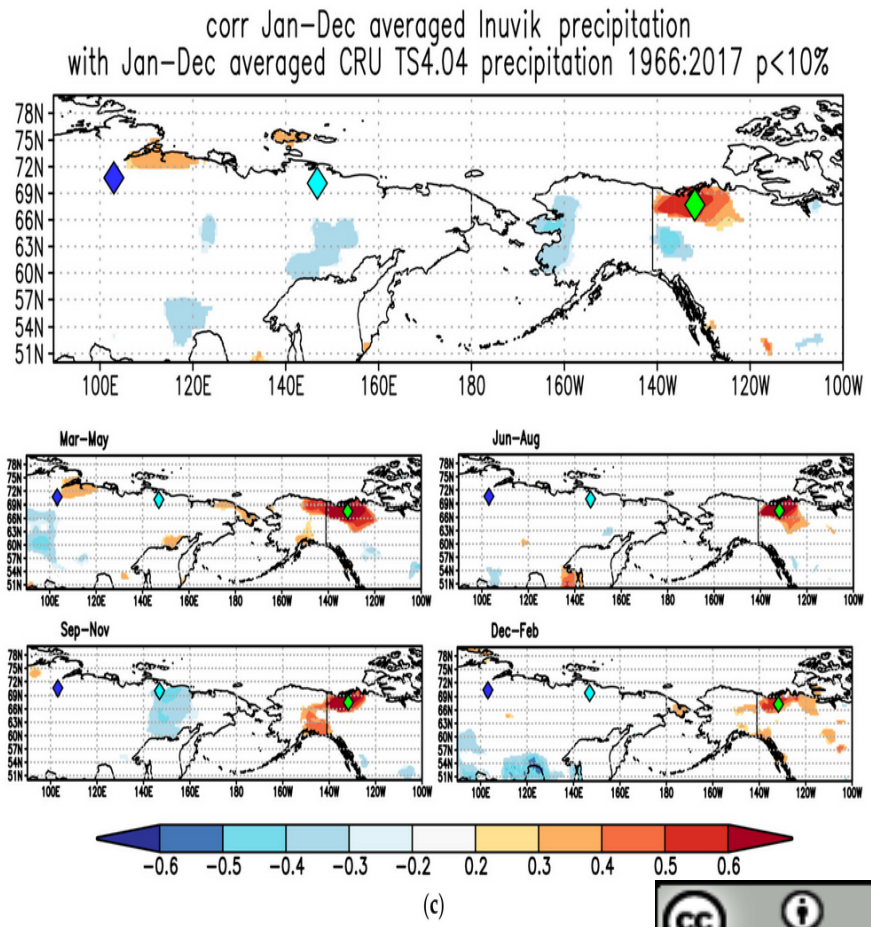
## YAK




## TAY

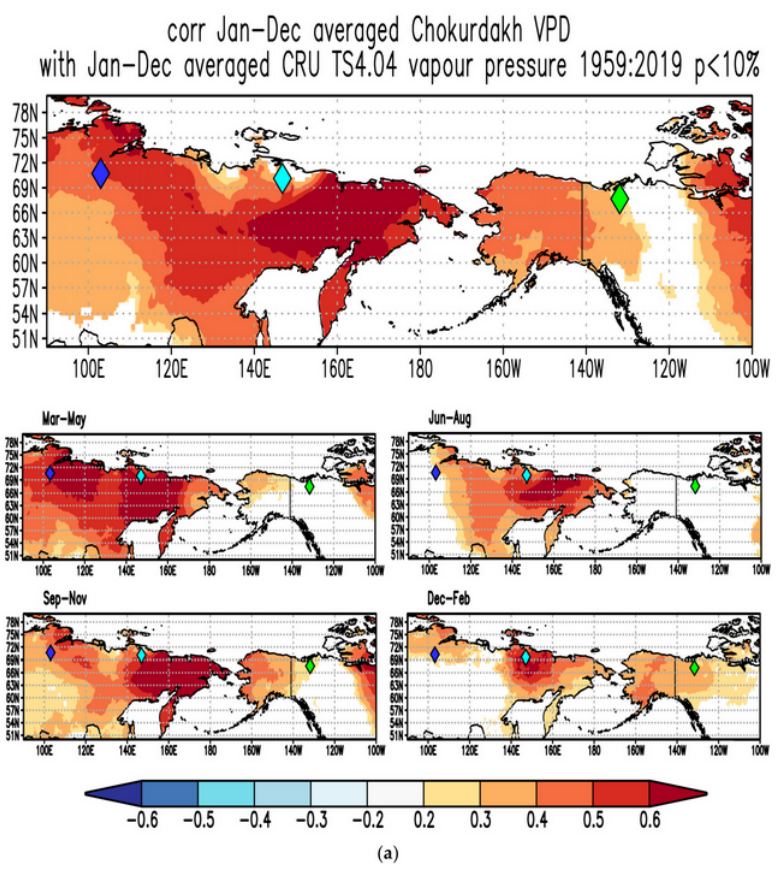



## CAN

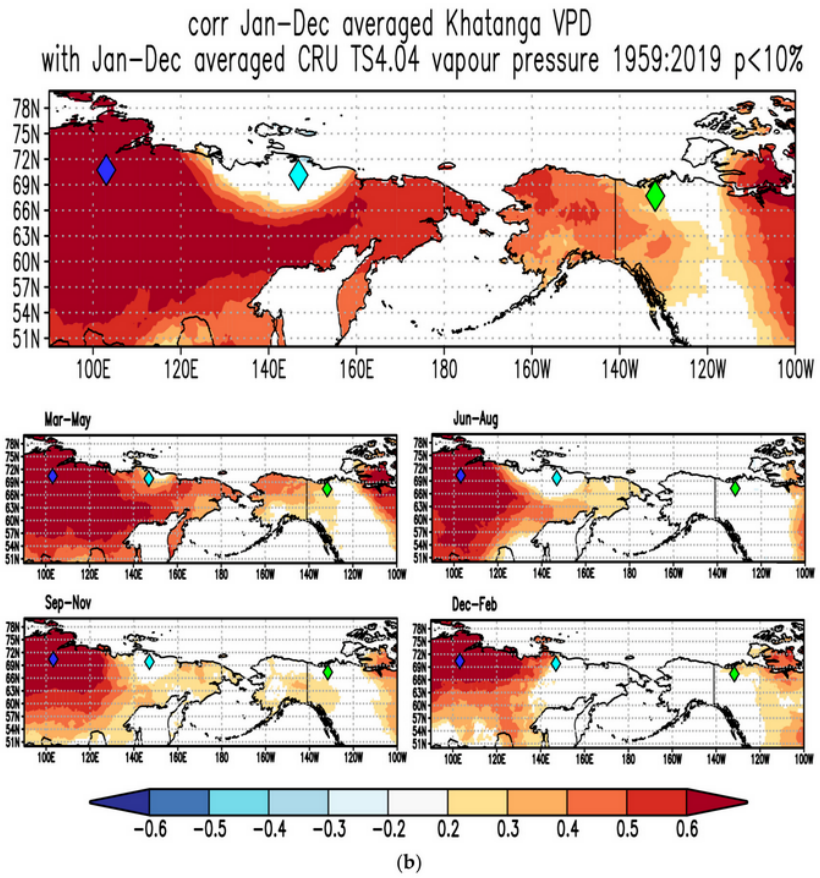


# SPATIAL DISTRIBUTION OF CORRELATION COEFFICIENTS BETWEEN GRIDDED AND LOCAL VAPOR PRESSURE DEFICIT (VPD)

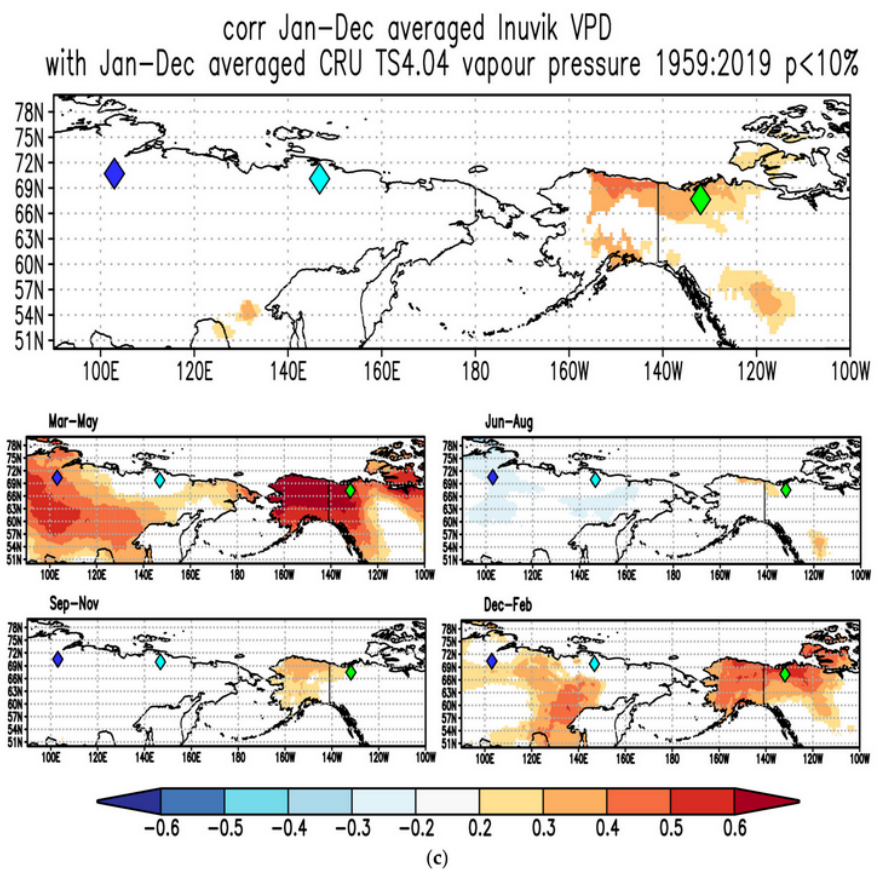
## YAK




## TAY




## CAN



# TAKE-HOME MESSAGE

- Significant precipitation, temperature and VPD changes occurred during winter, spring and autumn since 1980s and even more pronounced from 2000s.
- Accurate extrapolation of the climatic data back into the past by using local and gridded data for remote subarctic sites will improve the quality of climate reconstructions and climate prediction models.

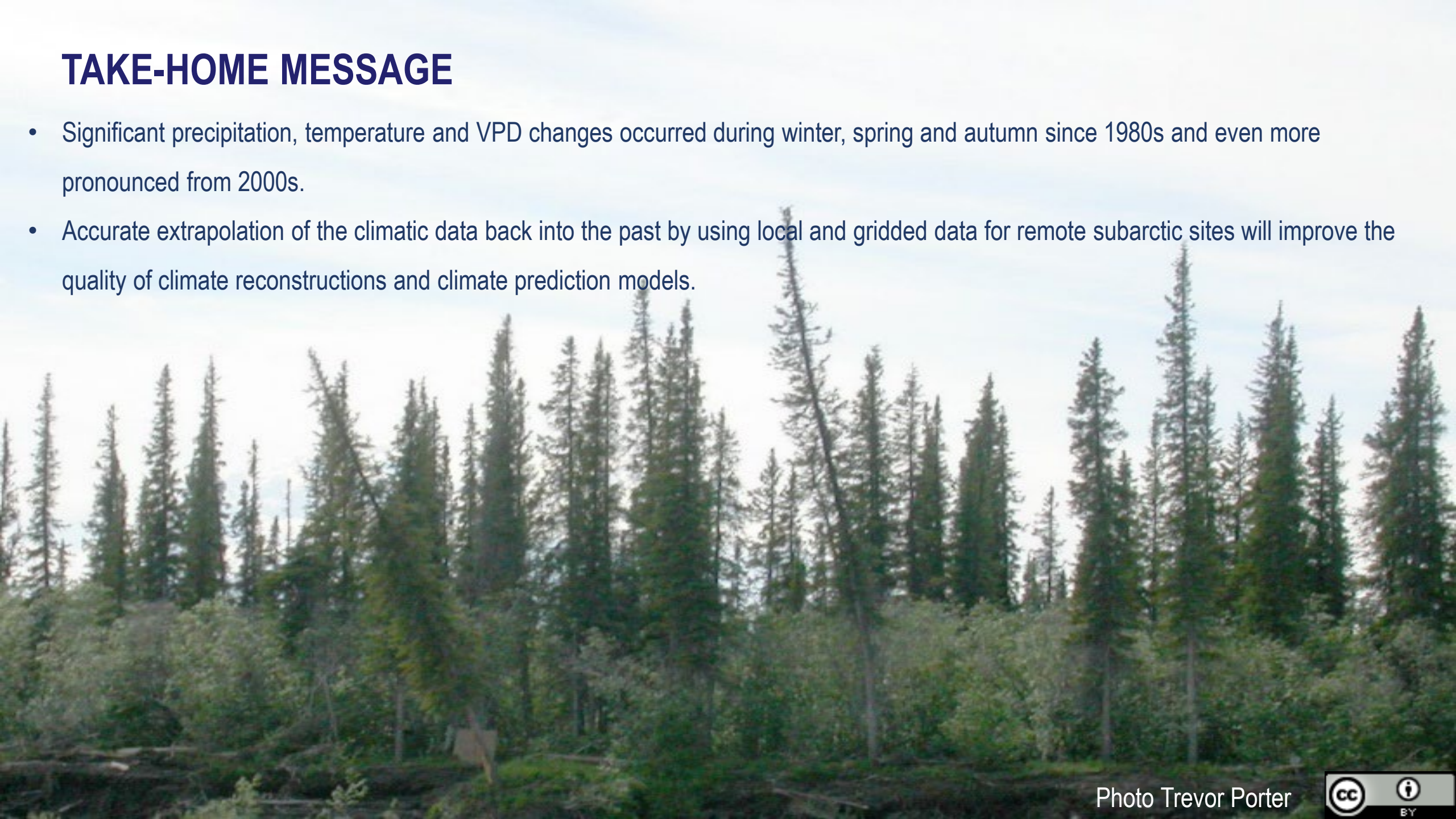


Photo Trevor Porter

EGU General Assembly 2022

СИБИРСКИЙ ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ | SIBERIAN FEDERAL UNIVERSITY

Eidg. Forschungsanstalt für Wald, Schnee und Landschaft WSL

UNIVERSITY OF TORONTO MISSISSAUGA

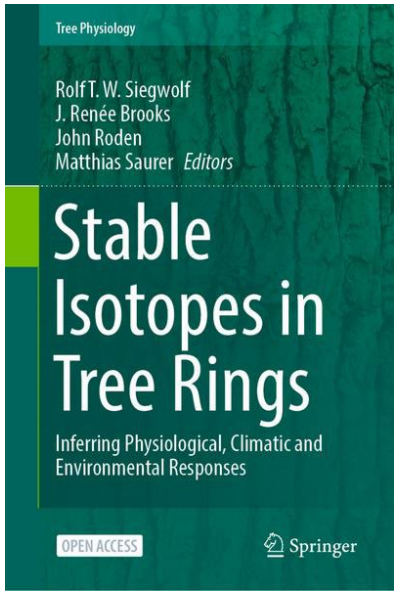
atmosphere

Open Access Article

# Mixed Temperature-Moisture Signal in $\delta^{18}O$ Records of Boreal Conifers from the Permafrost Zone

by Mikhail S. Zharkov [1], Marina V. Fonti [1], Tatyana V. Trushkina [2], Valentin V. Barinov [1], Anna V. Taynik [1], Trevor J. Porter [3], Matthias Saurer [4] and Olga V. Churakova (Sidorova) [1,4,*]

*Atmosphere* **2021**, *12*(11), 1416;
https://doi.org/10.3390/atmos12111416




Acknowledgements : *This work was supported by the Russian Science Foundation (RSF) grant number 21-17-00006.*

forests

# Special Issue "Stable Isotopes in Dendroecology"

IMPACT FACTOR 2.634

CITESCORE 3·3 SCOPUS

We encourage contributions which use the application of stable carbon, oxygen, hydrogen, and nitrogen isotopes and compound-specific isotope analyses in dendro-material (wood, cellulose, non-structural carbohydrates) to enhance our understanding of the ecophysiological mechanisms underlying tree growth. We are interested in contributions that look at recent and/or past climatic changes at seasonal or longer temporal scales.

**Deadline:** 20 October 2022

Link for submission is here

## Special Issue Editors


**Dr. Olga Churakova (Sidorova)** E-Mail Website SciProfiles

*Guest Editor*

Laboratory of Ecosystems Biogeochemistry, Institute of Ecology and Geography, Siberian Federal University, Svobodny pr. 79, 660041 Krasnoyarsk, Russia

**Interests:** tree-ring parameters; stable isotope biogeochemistry; ecology; paleoclimatology; permafrost; drought; climate change



**Dr. Marco M. Lehmann** E-Mail Website SciProfiles

*Guest Editor*

Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Zürcherstrasse 111, CH-8903 Birmensdorf, Switzerland

**Interests:** compound-specific isotope analyses (LC- & GC-IRMS, IRIS & CRDS); plant physiological measurements (gas-exchange & leaf traits); plant molecular biology (plant mutants); biochemical approaches (enzyme activities, compound concentrations); tree rings; paleoclimate