PAN-EURASIAN EXPERIMENT (PEEX)
– OVERVIEW ON THE RECENT SCIENTIFIC RESULTS

H.K. LAPPALAINEN[1,2,3], V-M. KERMINEN[1], N. ALTIMIR[1,] A. MAHURA[1], , E. EZHOVA[1], T.VIHMA[2], P. UOTILA[1], S. CHALOV[4], P. KONSTANTINOV[4], M. ARSHINOV[5], *Y. QIU[6],* I. EZAU[7], I.KUKKONEN8, V. MELNIKOV[5], A. DING[8], A. BAKLANOV[9], N. KASIMOV[5], H. GUO[6], V. BONDUR[10], T.PETÄJÄ[1,3], S. ZILITINKEVICH[1,2,3,12], M. KULMALA[1,3] & PEEX Teams

[1)] Institute for Atmospheric and Earth System Research (INAR)/ Faculty of Science, Physics, University of Helsinki (UHEL), Helsinki, Finland.[2)]Finnish Meteorological Institute (FMI), Helsinki, Finland [3)] University of Tyumen, Russia [4)] Moscow State University (MSU), Moscow, Russia [5)] Institute of Atmospheric Optics, Tomsk 634055, Russia [6)] Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences, Beijing 100101, China [7)] Nansen Environmental and Remote Sensing Center, NERSC, Norway 8) University of Helsinki, Finland [9)]Institute for Climate and Global Change, Research & School of Atmospheric Sciences, Nanjing University, 210023 Nanjing, China [10)] World Meteorological Organization, 1211 Genève, Switzerland [11)] AEROCOSMOS Research Institute for Aerospace Monitoring, Moscow, Russia
[12)] Dept. of Radiophysics, Nizhny Novgorod State University, Russia

EGU Online Chat PEEX session
Vienna 08.May.2020

Pan-Eurasian Experiment
PEEX

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Pan-Eurasian Experiment
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Key Question
Why understanding of Atmosphere – Earth Surface – Biosphere is important for Climate Change ?

- New feedback mechanism / interactions / processes
- More time to act: Mitigate & Adapt

TOOLS for understanding of Atmosphere – Earth Surface – Biosphere interaction, feedbacks

- Pan-Eurasian Experiment (PEEX) Program for understanding the Atmosphere – Earth Surface – Biosphere in the Arctic – boreal context / Northern Eurasia / Silk Road Region (2012 ->)
- GlobalSMEAR (Stations Measuring Earth Surface Atmosphere Realtions) Initiative for Global Earth Observatory for filling the observational gap of the atmospheric – ecosystem in situ data (2015 - >

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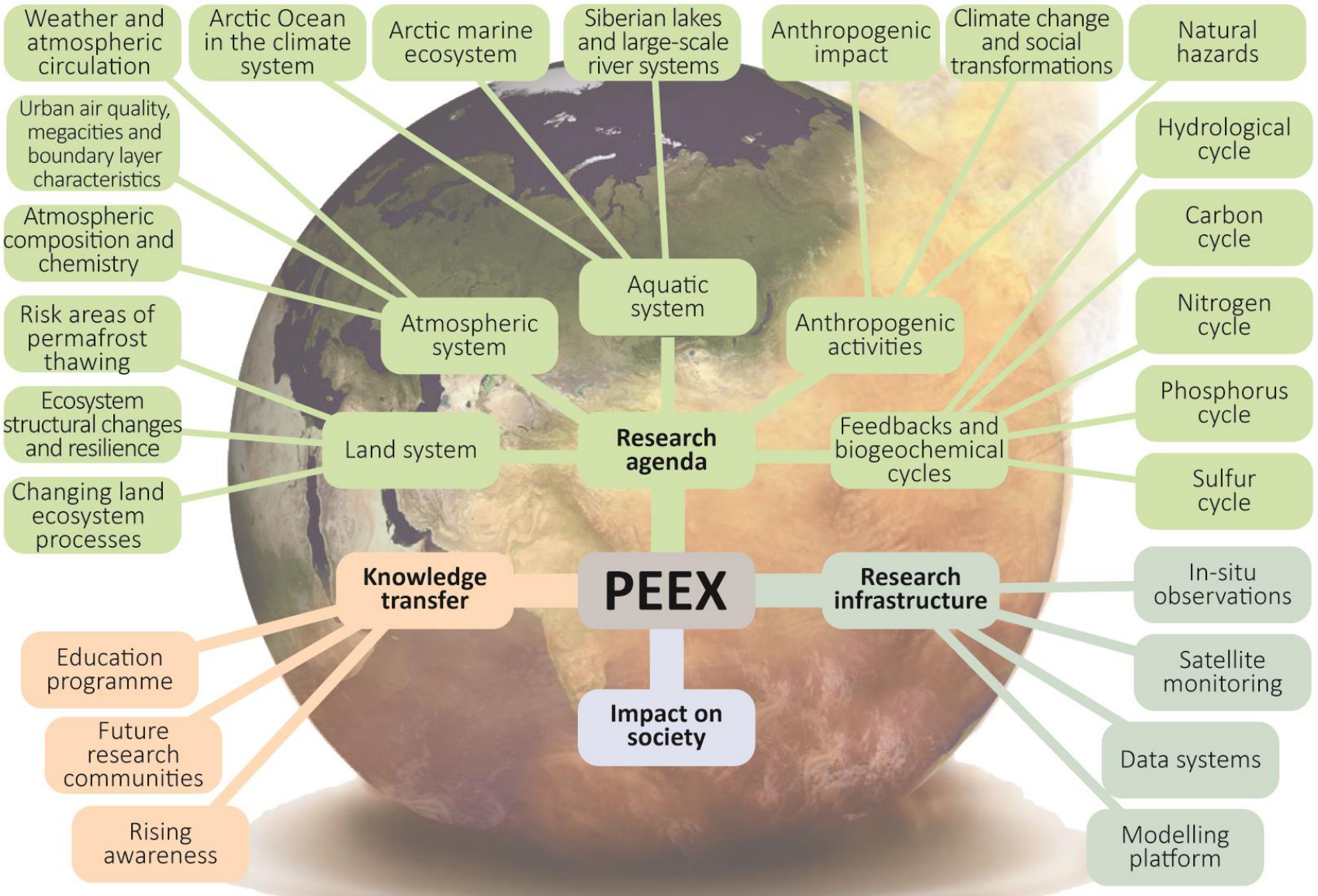
PROGRAM STRUCTURE



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PEEX RESEARCH

https://www.atmos-chem-phys.net/special_issue395.html

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Special issue
Pan-Eurasian Experiment (PEEX)
Editor(s): V.-M. Kerminen, M. Heimann, D. Spracklen, T. Laurila, A. Ding, and I. Salma
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03 May 2019
Increased inorganic aerosol fraction contributes to air pollution and haze in China
Yonghong Wang, Yuesi Wang, Lili Wang, Tuukka Petäjä, Qiaozhi Zha, Chongshui Gong, Sixuan Li, Yuepeng Pan, Bo Hu, Jinyuan Xin, and Markku Kulmala
Atmos. Chem. Phys., 19, 5881–5888, https://doi.org/10.5194/acp-19-5881-2019, 2019
Short summary

02 Apr 2019
Vertical profiles of sub-3 nm particles over the boreal forest

REPORT SERIES IN AEROSOL SCIENCE
N:o 201 (2017)

Proceedings of the 3rd Pan-Eurasian Experiment (PEEX) Conference and the 7th PEEX Meeting

Editors: Hanna K. Lappalainen, Päivi Haapanala, Alla Borisova, Sergey Chalov, Nikolay Kasimov, Sergej Zilitinkevich, and Markku Kulmala

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FINNISH ASSOCIATION FOR AEROSOL RESEARCH

Helsinki 2017

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Special Issue: Pan-Eurasian Experiment (PEEX)

Vol 11, No 1 (2018)

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GEOGRAPHY

PAN-EURASIAN EXPERIMENT (PEEX) PROGRAM: AN OVERVIEW OF THE FIRST 5 YEARS IN OPERATION AND FUTURE PROSPECTS

Hanna K. Lappalainen, Nuria Altimir, Veli-Matti Kerminen, Tuukka Petäjä, Risto Makkonen, Pavel Alekseychik, Nina Zaitseva, Irina Bashmakova, Joni Kujansuu, Antti Lauri, Päivi Haapanala, Stephany B. Mazon, Alla Borisova, Pavel Konstantinov, Sergej Chalov, Tuomas Laurila, Eija Asmi, Heikki Lihavainen, Jaana Bäck, Michael Arshinov, Alexander Mahura, Steven Arnold, Timo Vihma, Petteri Uotila, Gerrit de Leeuw, Ilmo Kukkonen, Svetlana Malkhazova,

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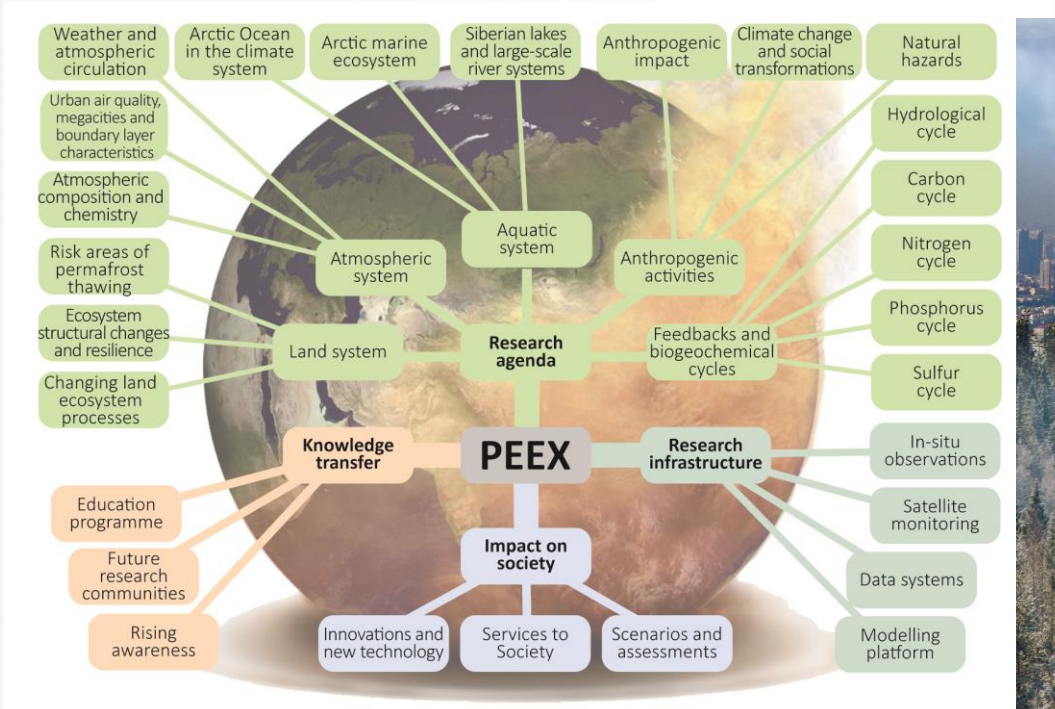
PEEX PROGRAM



www.atm.helsinki.fi/peex/

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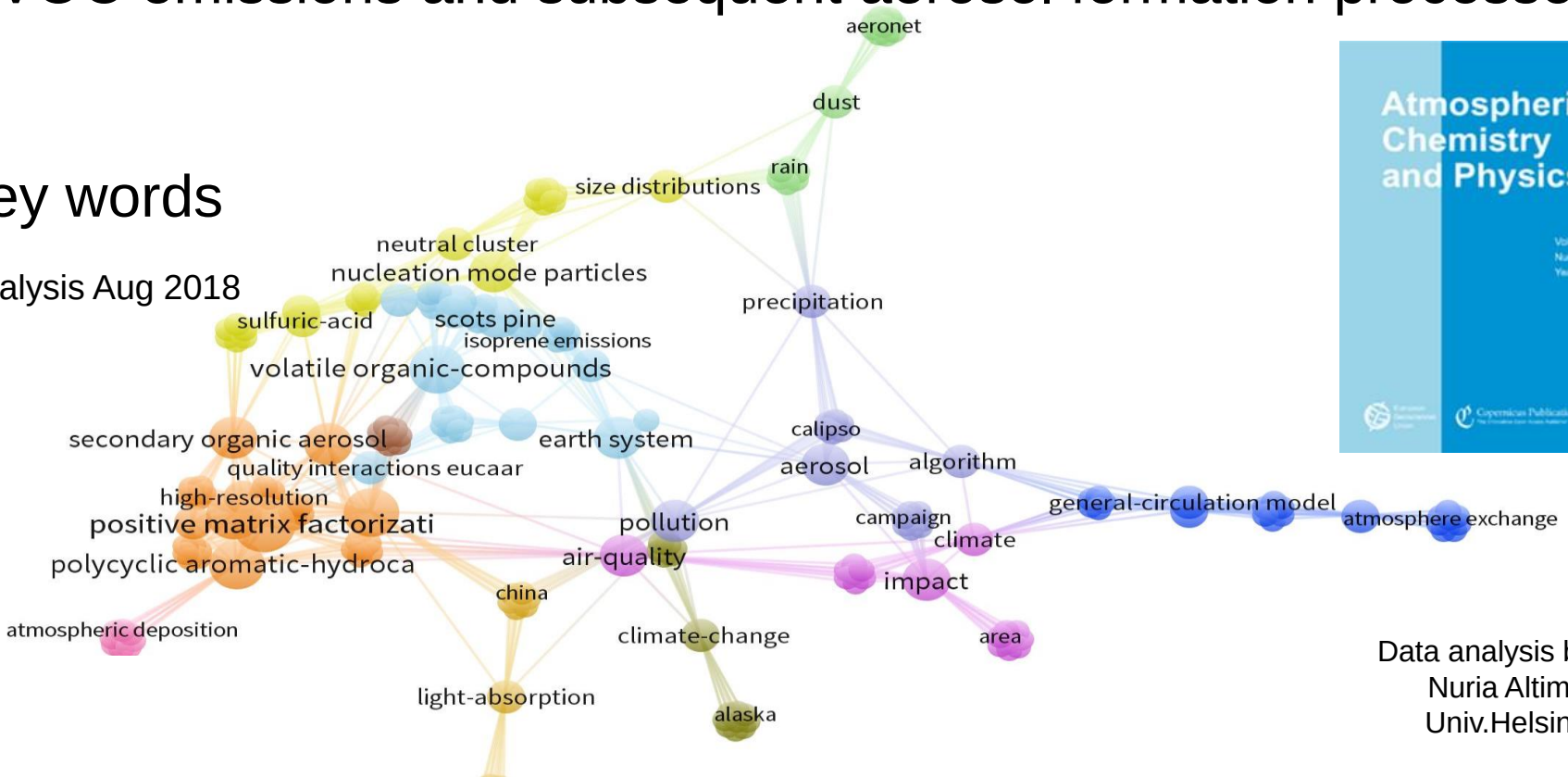
FOR EXAMPLE RESEARCH OUTPUT ACP-PEEX

54 papers in a final form have been published by Aug 2019.

foci of the results has been on the role of boreal forest and their BVOC emissions and subsequent aerosol formation processes.

key words

Analysis Aug 2018



Data analysis by
Nuria Altimir,
Univ.Helsinki

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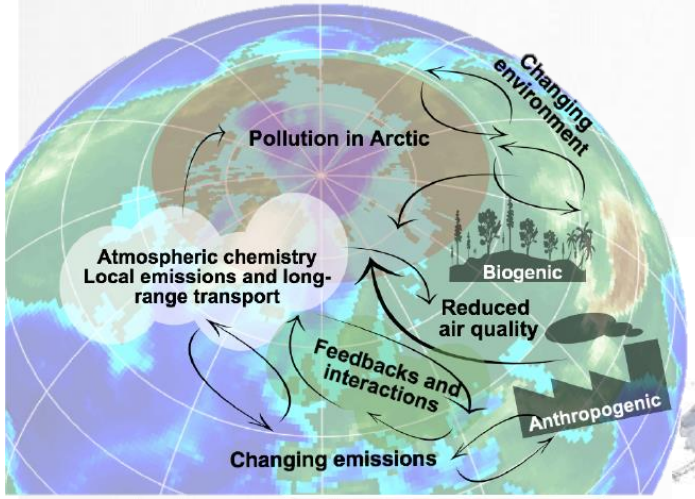
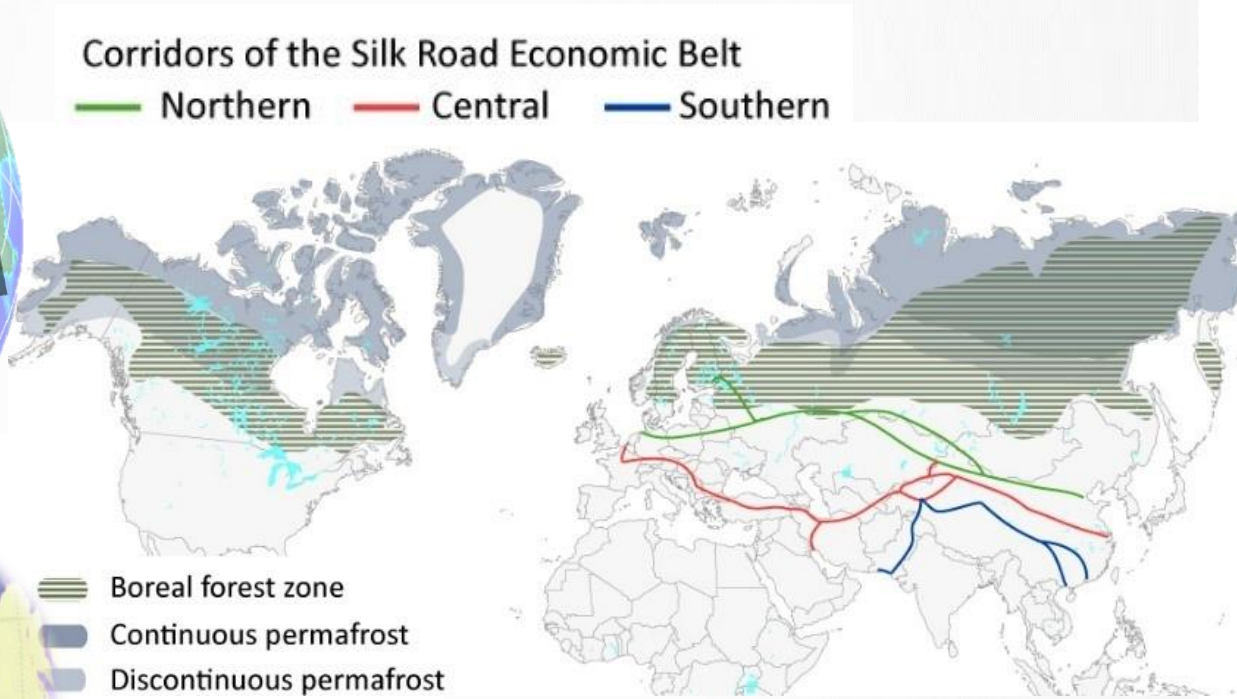
PEEX COLLABORATION WITH

- RUSSIA: FOCUS ON ARCTIC BOREAL REGION
- CHINA: FOCUS ON SILK ROAD REAGION





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RESEARCH HIGH LIGHTS RUSSIA

- Medical-geographical analysis of distribution of natural focal diseases in Yamalo-Nenets Autonomous Okrug accounting for climate change with *Prof. Svetlana Malkhazova group, Moscow State University*
- Permaforst analysis & Mechanisms, pathways and patchiness of the Arctic ecosystem responses and adaptation to changing climate (CLIMECO) in collaboration with *Academician Vladimir Melnikov group, University of Tyumen*
- Land – atmosphere feedback loops over Northern Eurasia in collaboration with *Prof. Boris Belan and Dr. Michael Arshinov V.E. Zuev Institute of Atmospheric Optics*
- GHG fluxes at the Mukhrino Field Station West Siberia, Profs. Elena Lapshina, Yugra State University (West Siberia)

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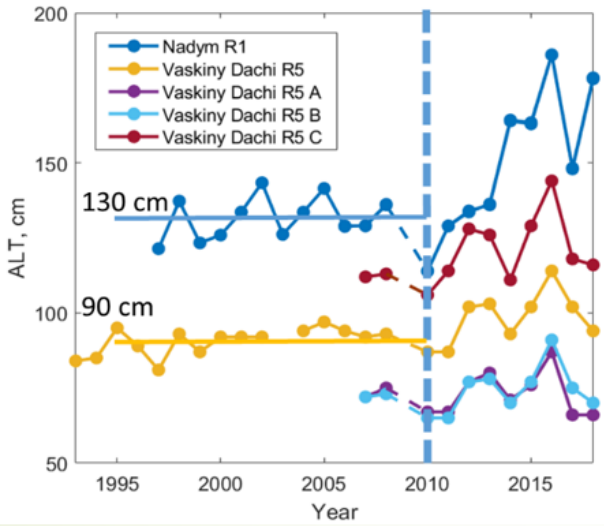
PEEX RUSSIA RESEARCH HIGH LIGHTS

EZHOVA et al. Potential Links between Precipitation and Anthrax Outbreak in the North-West Siberia. Manuscript under preparation

Dynamics of active layer thickness (ALT) and temperature



ALT dynamics in Nadym can not be explained by air temperature

PEEX RUSSIA RESEARCH HIGH LIGHTS

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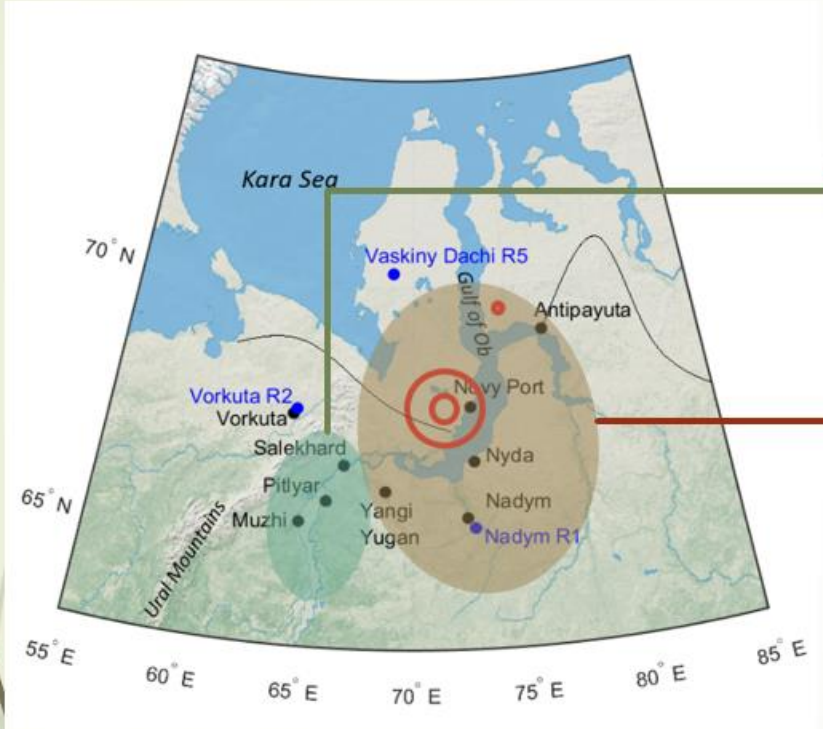
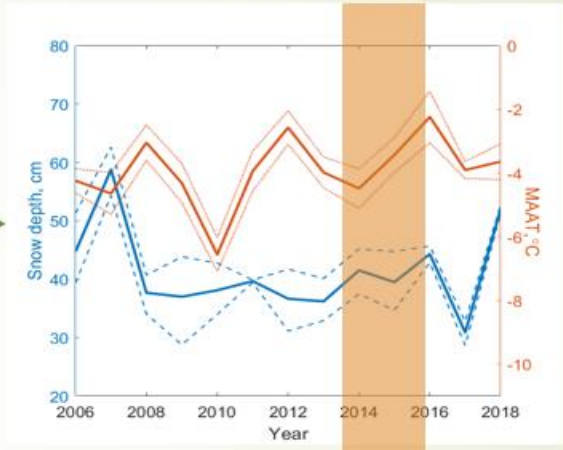
EZHOVA et al. Potential Links between Precipitation and Anthrax Outbreak in the North-West Siberia. Manuscript under preparation

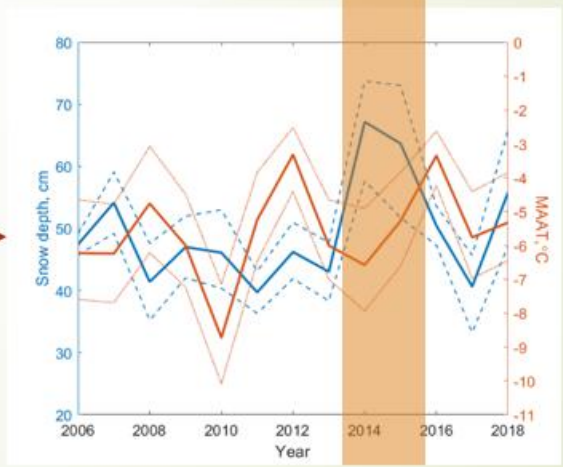
Snow thickness



No increase in snow thickness



More than 50% increase in snow thickness, 2014-2015



Snow insulates ground surface preventing heat exchange between atmosphere and ground. The ground does not freeze.

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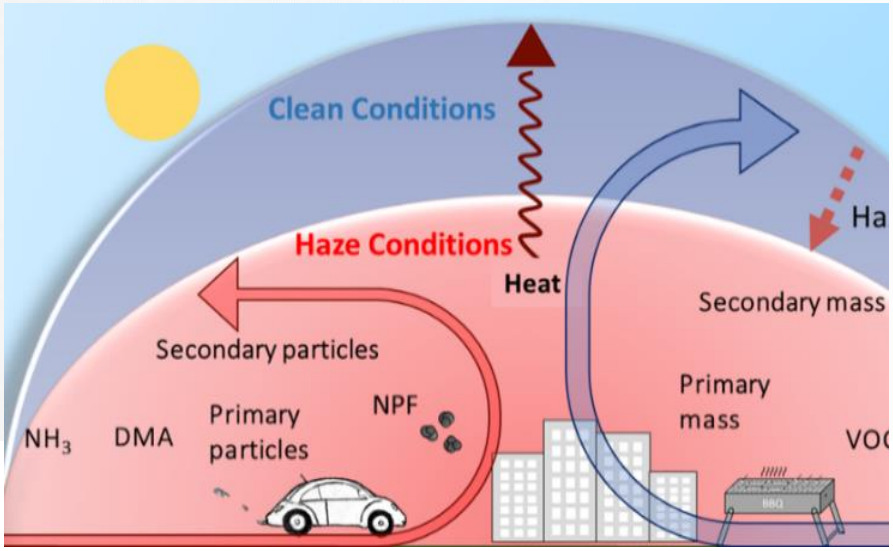
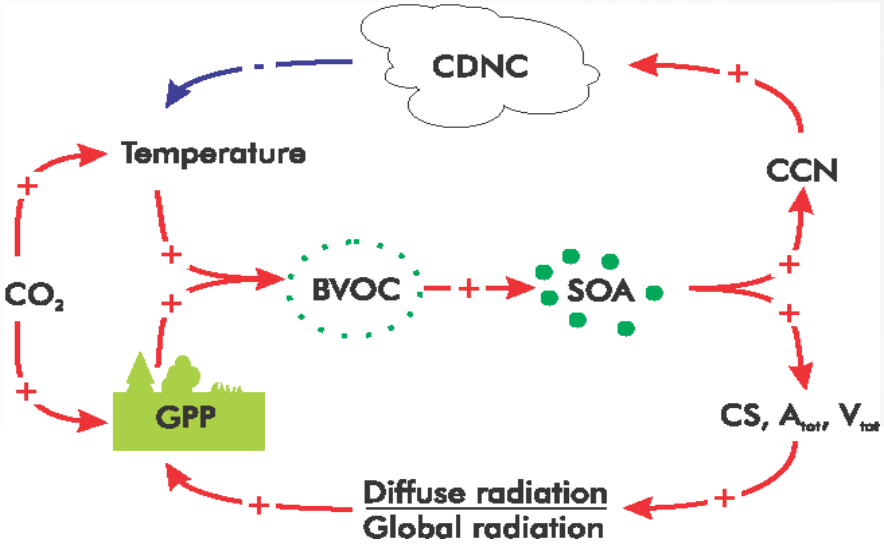
PEEX RESEARCH – RUSSIA FUTURE STEPS

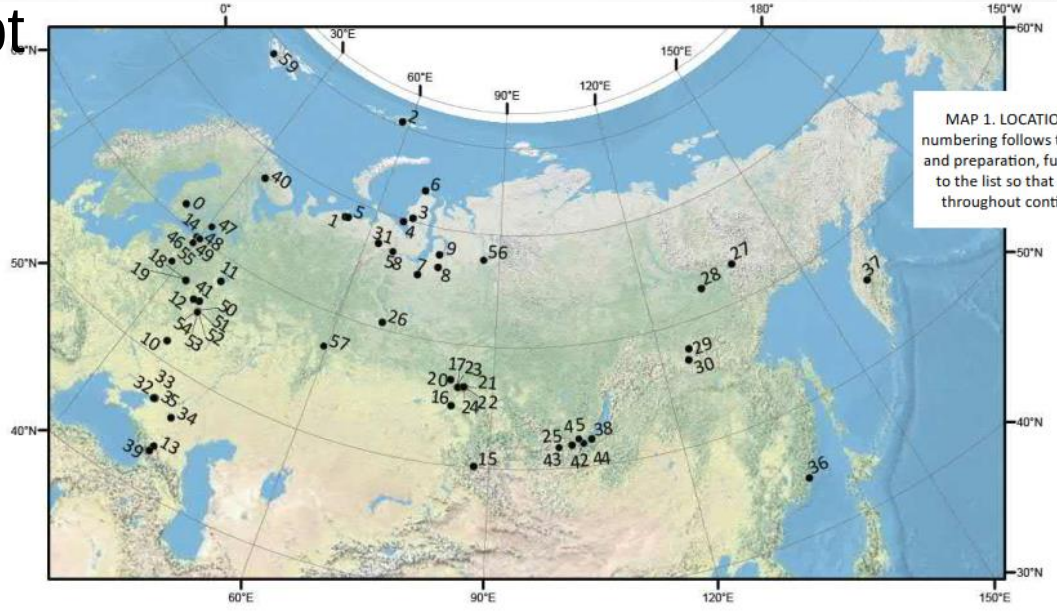
- to establish super station for continuous comprehensive SMEAR type observations
- to find out proper feedback loops, to quantify formation and urban heat island – air pollution – boundary layer dynamics interactions and feedbacks (Kulmala EU ERC Grant)





PEEX RESEARCH RI – RUSSIA FUTURE STEPS

- introducing the exisiting observation capacity
  - to enchance the collaboration among research communitie in Russia and outside Russia
  - to provide grounds for the sation upgrading based on SMEAR concept



MAP 1. LOCATION AND NUMBERING. The numbering follows the order of material receival and preparation, future additions are appended to the list so that stations retain the number throughout continuous catalogue updates.

0 Hyytiälä
1 Kashin
2 Heiss
3 Vaskiny Dachi
4 Marre-Sale Weather Station
5 Bolvansky
6 Belyy
7 Nadym
8 Urengoy FT
9 Urengoy T
10 Kursk BS
11 Borok GO
12 Zvenigorod SS
13 Kisdlovodsk HMS
14 Peterhof
15 Aktru
16 Novosibirsk MIS
17 Fonovaya
18 Okovskiy forest RyFyo:bog
19 Okovskiy forest RyFyo
20 Vasyuganie
21 IMCES GO
22 Siberian Lidar Station
23 Tomsk, site Kireevsk
24 Tomsk, site Tomsk
25 Tory
26 Mukhrino
27 Lazurnaya
28 Chyappara
29 Tajezhka
30 Lookuchakit
31 Seida-Vorkuta
32 Donskoy
33 Kagalnik
34 Manych
35 Vzmorje
36 Smyichka
37 Bolgyt
38 Istomino
39 Elbrus
40 Khibiny
41 Krasnovidovo
42 Listvyanka
43 Mondy
44 Bolshie Koty
45 Irkutsk Urban Station
46 RSHU-Daimische
47 RSHU-Valaam
48 RSHU-Urban1
49 RSHU-Urban2
50 LTM-Agro
51 LTM-MMF
52 LTM-SDF
53 LTM-CG
54 LTM-UG
55 Pushkinskie Gory
56 Igarka
57 Kourovka
58 Labytnangi
59 Barentsburgh (AARI)

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PEEX RESEARCH CHINA

Big Earth Data

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The Silk Road agenda of the Pan-Eurasian Experiment (PEEX) program

Hanna K. Lappalainen, Markku Kulmala, Joni Kujansuu, Tuukka Petäjä, Alexander Mahura, Gerrit de Leeuw, Sergej Zilitinkevich, Merli Juustila, Veli-Matti Kerminen, Bob Bornstein, Zhang Jiahua, Xue Yong, Qiu Yubao, Liang Dong, Liu Jie & Guo Huadong

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PEEX R&B RESEARCH PROGRAM THEMES

Lappalainen et al. The Silk Road agenda of the Pan-Eurasian Experiment (PEEX) program, Big Earth Data, 2:1, 8-35, 2018, doi: 10.1080/20964471.2018.1437704

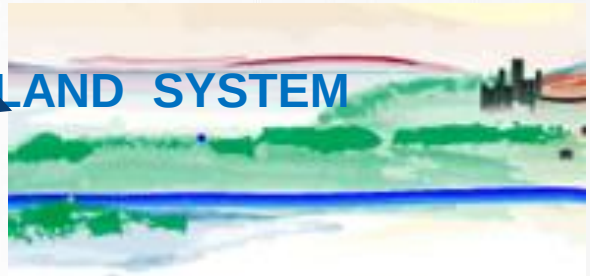
HYDROSPHERE /CRYOSPHERE

- high-mountain cold regions, especially the Tibetan Plateau

ATMOSPHERIC SYSTEM

SOCIETY

LAND SYSTEM



- land use change connecting human actions to large-scale physical, chemical and biological processes
- monsoon dynamics
- land degradation

interaction between the atmospheric system with changing land ecosystems / societal systems / aquatic systems

- air quality – climate interactions
- urban air quality: aerosols, gas-to-particle conversions, LVOCS, urban heat/cool islands, PBL

IN SITU MEASUREMENTS: GlobalSMEAR

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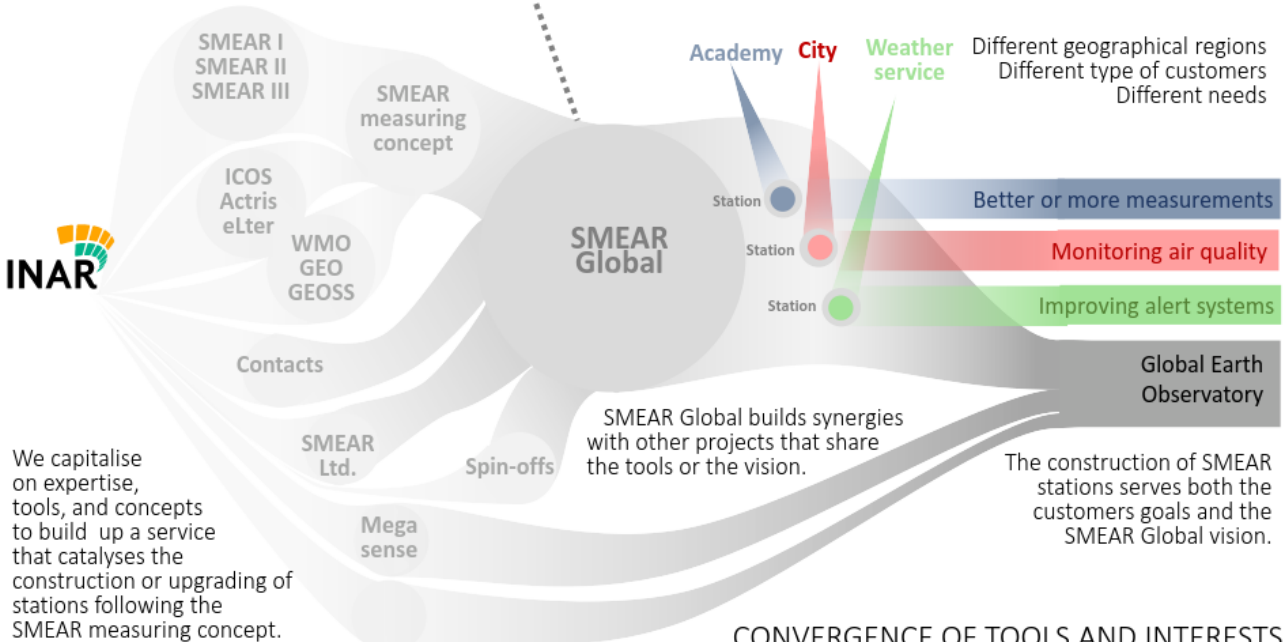
EXISTING UPSCALING



organization of the existing R&B region observation network should be based on the concept of a hierarchy of in situ stations aimed at providing continuous, comprehensive observations of atmospheric composition and ecosystem processes

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PEEX Science Plan re-visited

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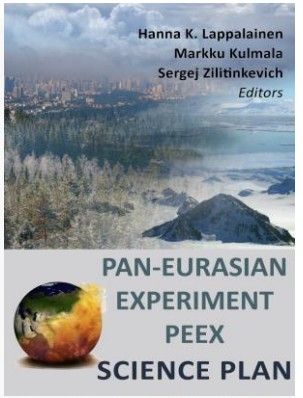

PAN EURASIAN EXPERIMENT
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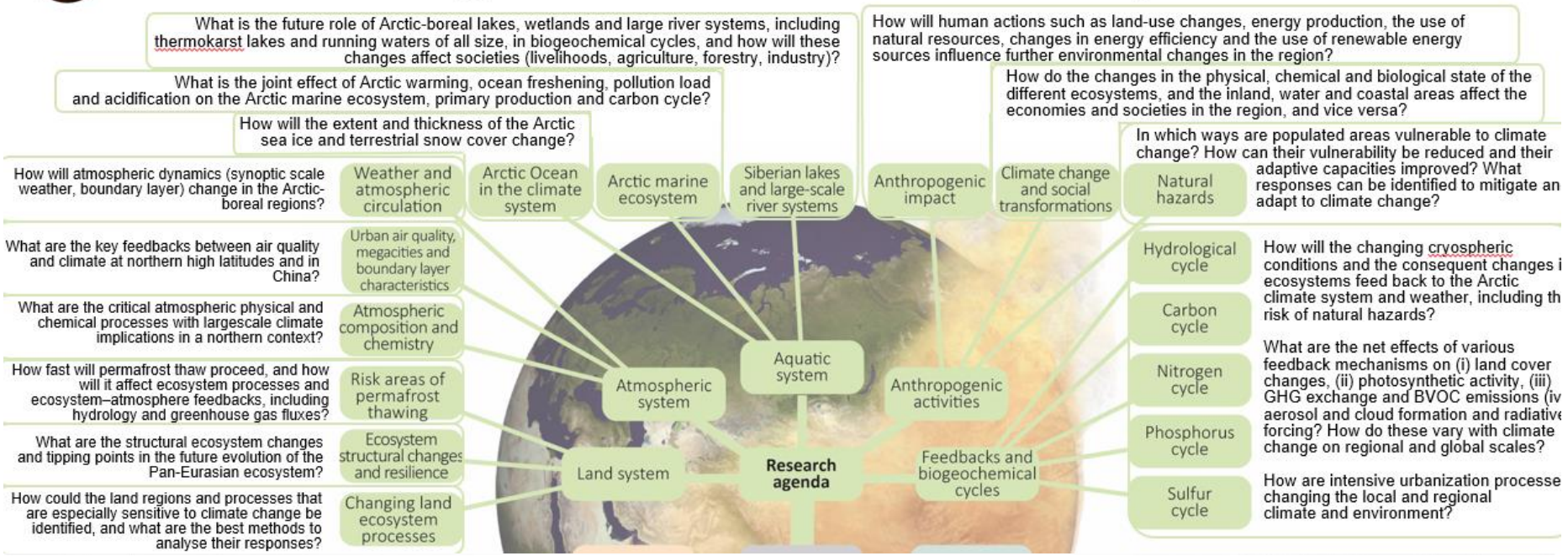
Large-scale research questions:



- data gathering in 2019: questionary, papers published in PEEX ACP special issue, other relevant sources
- analysis & vizualization & writing & submission in 2020

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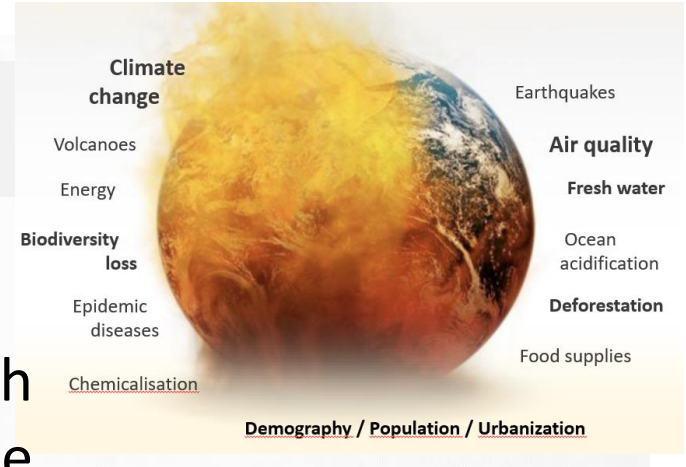
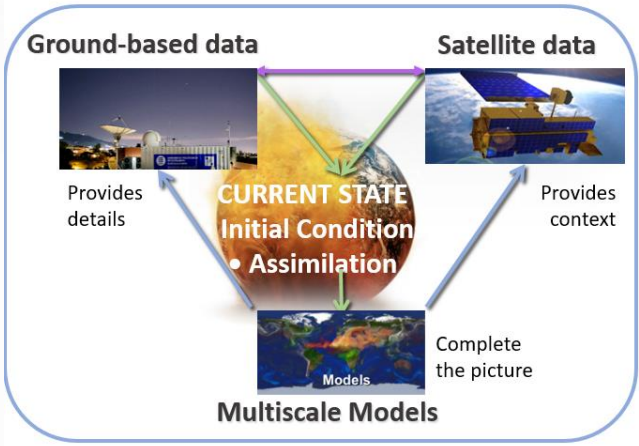
SYMMARY



- PEEX program is addressing the research agenda and research infrastructure in the topical areas, which are needed to find practical solutions to ensure the sustainable development of the Northern Eurasian and B&R environment, society and economy
- new understanding of the land-atmosphere interactions together with the coordinated, comprehensive observation system in these domains has significant societal and economic impact at regional and global scales (ref. PEEX overview paper in progress)
- these plans are needed for attracting government and private sector investments.



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THANK YOU

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