

**INAR**  
INSTITUTE FOR ATMOSPHERIC AND  
EARTH SYSTEM RESEARCH

# PAN-EURASIAN EXPERIMENT (PEEX) PROGRAM

Dr. Hanna K. Lappalainen  
PEEX / GlobalSMEAR Secretary General  
Institute for Atmospheric and Earth System Research (INAR)  
University of Helsinki

RSHU & SPBU & INAR-UHEL  
Online meetings 23- 24.April.2020

**PEEX-Academic Challenge – FIRST+**



**UArctic**



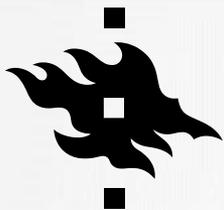
Pan-Eurasian Experiment

PEEX



SMEAR

GLOBAL  
CHALLENGES  
NEED GLOBAL  
MEASURES



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## Global grand challenges



## 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 Relations) Initiative for Global Earth Observatory for filling the observational gap of the atmospheric – ecosystem in situ data (2015 - >

# Academician Markku Kulmala

Academy Professor  
Academy of Finland

Director of INAR Institute,  
University of Helsinki, FI

Foreign Academician  
Member of CAS  
Member of RAS

Citation over 40000  
H-index =104  
ISI No. 1 Citation in  
Geoscience (2011-2018)



**Multidisciplinary Research / RI/ Education / Societal  
impact on the Arctic-boreal & China  
INITIATOR OF PEEEX PROGRAM**

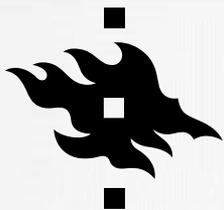
**Stations for Measuring Earth Surface - Atmospheric  
Relations (SMEAR)  
DEVELOPER AND FRONTMAN OF SMEAR CONCEPT**



Pan-Eurasian Experiment

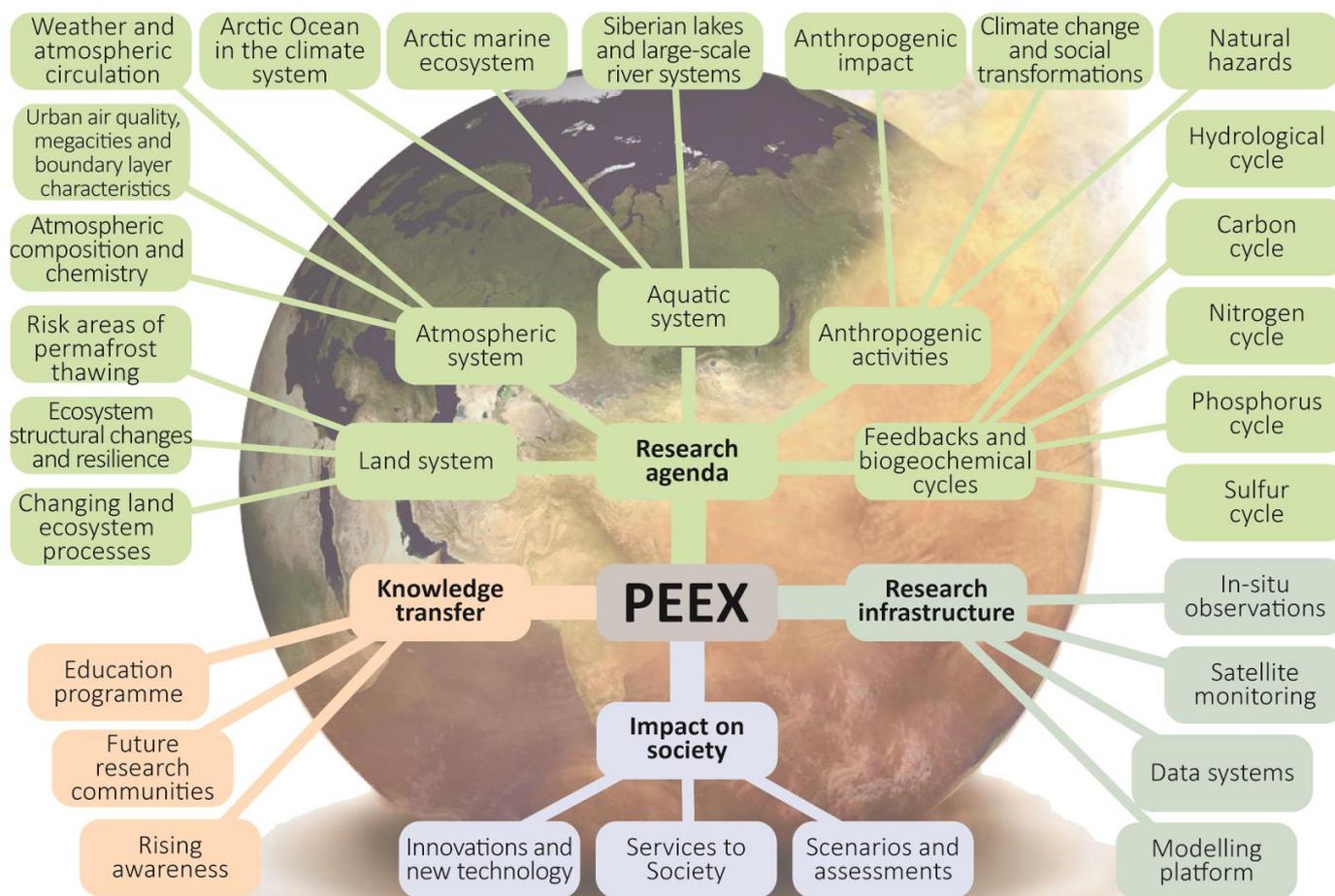
PEEX

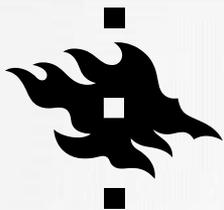




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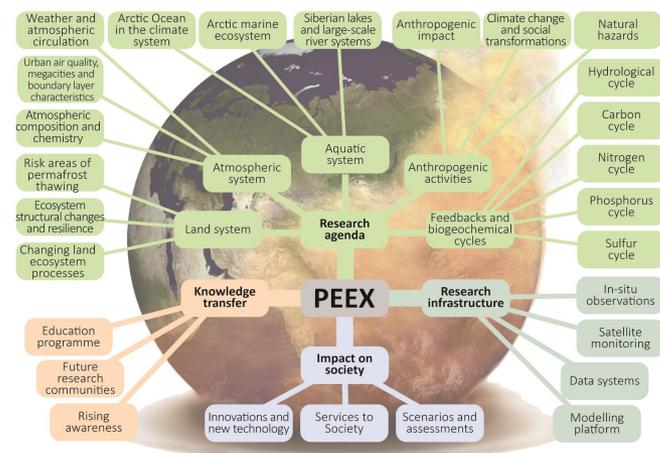




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# PEEX PROGRAM

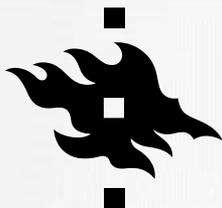
Hanna K. Lappalainen  
Markku Kulmala  
Sergej Zilitinkevich  
*Editors*



[www.atm.helsinki.fi/peex/](http://www.atm.helsinki.fi/peex/)



**PAN-EURASIAN  
EXPERIMENT  
PEEX  
SCIENCE PLAN**



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# PEEX RESEARCH

Atmospheric Chemistry and Physics  
An interactive open-access journal of the European Geosciences Union

Special issue  
**Pan-Eurasian Experiment (PEEX)**

Editor(s): V.-M. Kerminen, M. Heimann, D. Spracklen, T. Laurila, A. Ding, and I. Salma

Download citations of all papers

- Bibtex
- EndNote
- Reference Manager

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

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

REPORT SERIES IN AEROSOL SCIENCE  
No 201 (2017)

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

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

Helsinki 2017

GEOGRAPHY, ENVIRONMENT, SUSTAINABILITY  
Geography, environment, sustainability

ISSN 2071-9388 (Print)  
ISSN 2542-1565 (Online)

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**Special Issue: Pan-Eurasian Experiment (PEEX)**

**Vol 11, No 1 (2018)** View or download the full issue PDF

**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, Jani 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 Malkhozova, Heikki Paikku, Tuukka Petäjä, Irina Fedorova, Uuno Kristian Hapanen, Gerasios Debnokopoulos, Maria Inês Mota Lima

Scopus 0,56  
CiteScore Tracker 2018

Taylor & Francis Online  
Access provided by University of Helsinki

Journal  
**Big Earth Data**  
Volume 1, 2017 - Issue 1-2

3,716 Views  
17 Crossref citations to date  
0 Altmetric

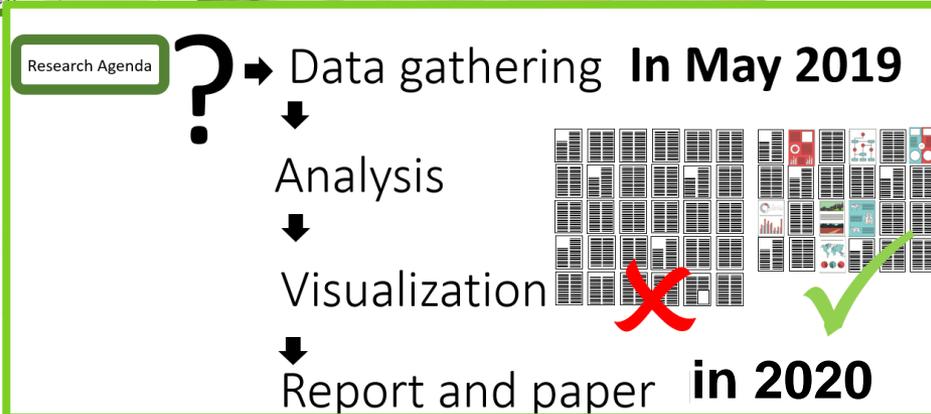
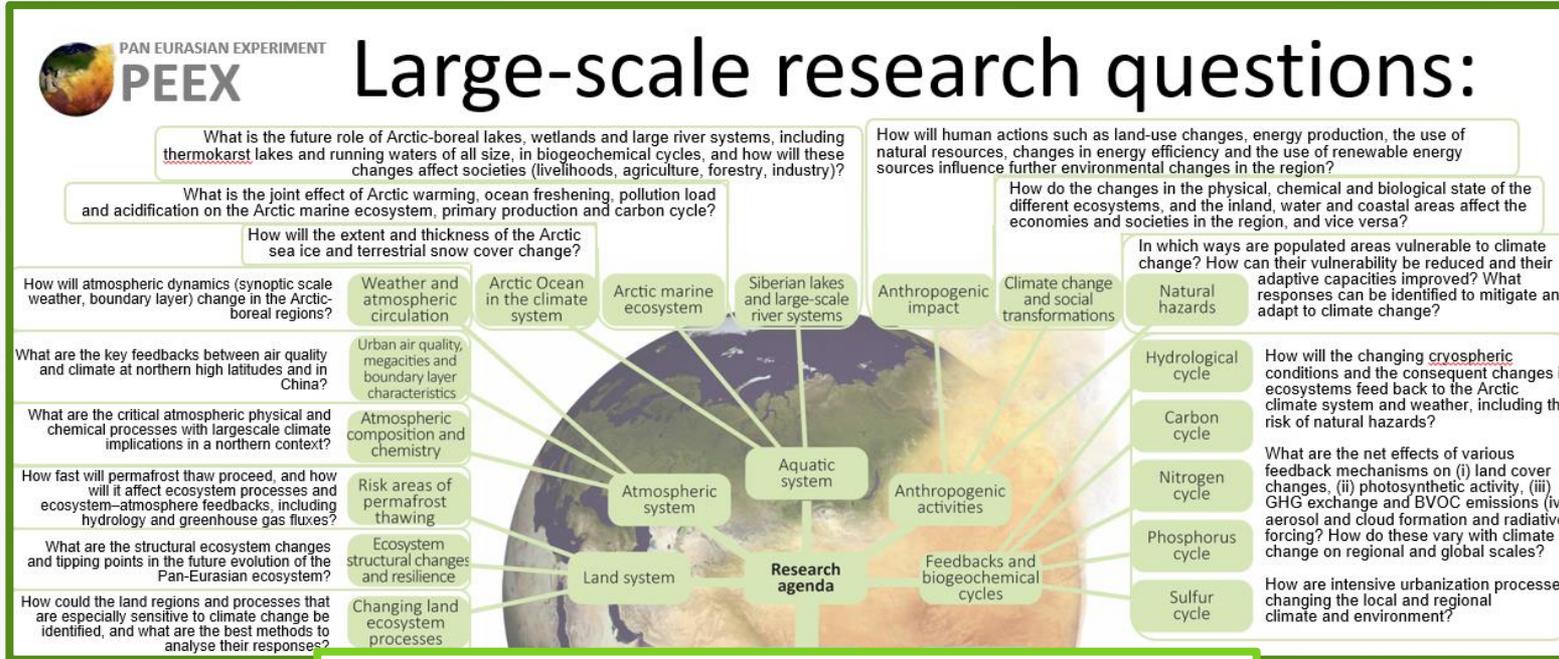
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**Big Earth data: A new frontier in Earth and information sciences**  
Huadong Guo

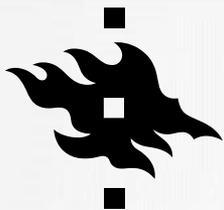
Pages 4-20 | Received 17 Oct 2017, Accepted 07 Nov 2017, Published online: 20 Dec 2017





## SCIENCE DONE LAST FIVE YEARS BY PEEX COMMUNITY

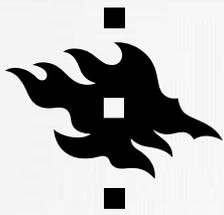




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# RESEARCH HIGH LIGHTS RUSSIA

- Medical-geographical analysis of distribution of natural focal diseases in Yamalo-Nenets Autonomous Okrug accounting for climate change / climate – health with *Prof. Svetlana Malkhazova group, Moscow State University*
- Permafrost dynamics & 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 /New Particle Formation in Siberia 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, Prof. Elena Lapshina, Yugra State University (West Siberia)



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# RESEARCH HIGH LIGHTS RUSSIA

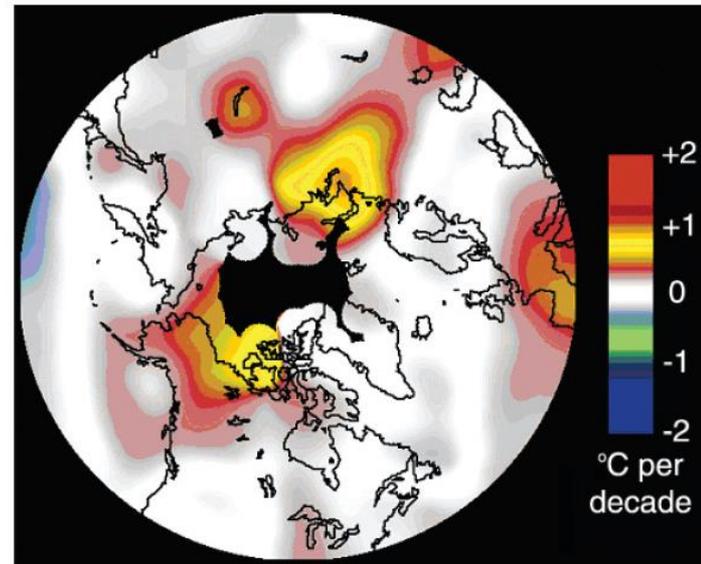
- Medical-geographical analysis of distribution of natural focal diseases in Yamalo-Nenets Autonomous Okrug accounting for climate change / climate – health with *Prof. Svetlana Malkhazova group, Moscow State University*

**EKATERINA EZHOVA Univ.Helsinki  
INAR et al.**

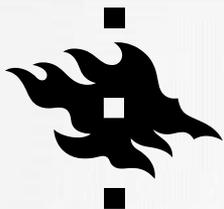
**Aim:** Study climate-health links using existing sets of data:

- Anthrax –permafrost link**
- Opisthorchiasis – hydrology link
- Tick-borne diseases – meteorology link
- West Siberia is a region with the strongest warming trend in Eurasia

**Anthrax =сибирская язва =[pernarutto](#)  
Opisthorchiasis =трематода = [maksamoto](#)  
Tick = клещ =[punkki](#)**



*Fig. 1. Trends in summer mean surface air temperature (°C per decade) from 40°N to 90°N for the years 1966–1995 (modified from Serreze et al. 2000; printed with kind permission of Kluwer Academic Publishers, M. Serreze and J. Walsh).*



- Land – atmosphere feedback loops over Northern Eurasia /New Particle Formation in Siberia in collaboration with *Prof. B.Belan and Dr. M.Arshinov V.E. Zuev Institute of Atm. Optics*

NPF project: Stations of IAO SB RAS

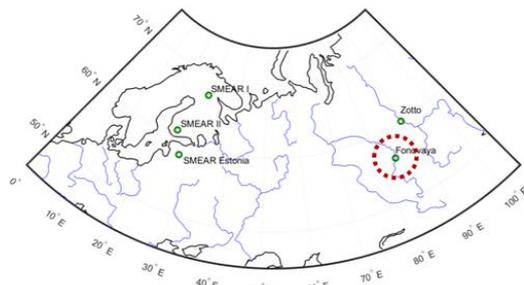
Fonovaya (56°25'N, 84°04'E):

Measurements of meteorology (T, P, U, RH),  
Trace gases (CH<sub>4</sub>, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, CO, O<sub>3</sub>)

Aerosol measurements:

Diffusion battery + CPC

Optical Particle Sizer



Fonovaya on the map

- We need to improve aerosol measurements and make them comparable to other stations -> a long-term campaign at Fonovaya

**Direct effect of aerosols on solar radiation and gross primary production in boreal and hemiboreal forests**

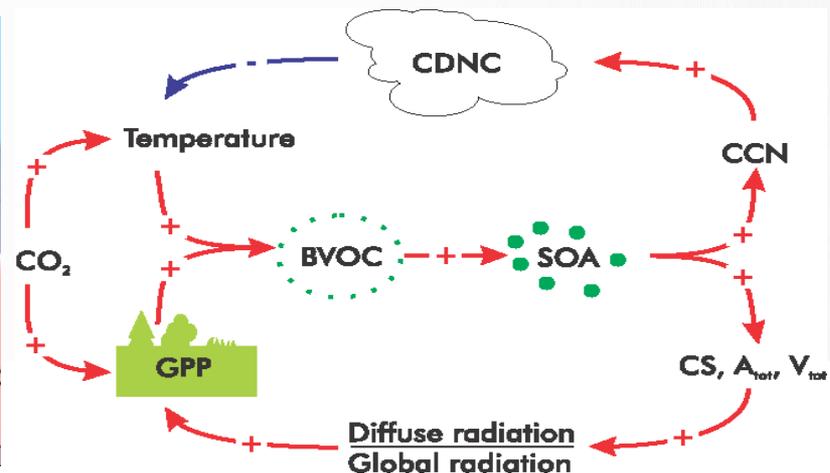
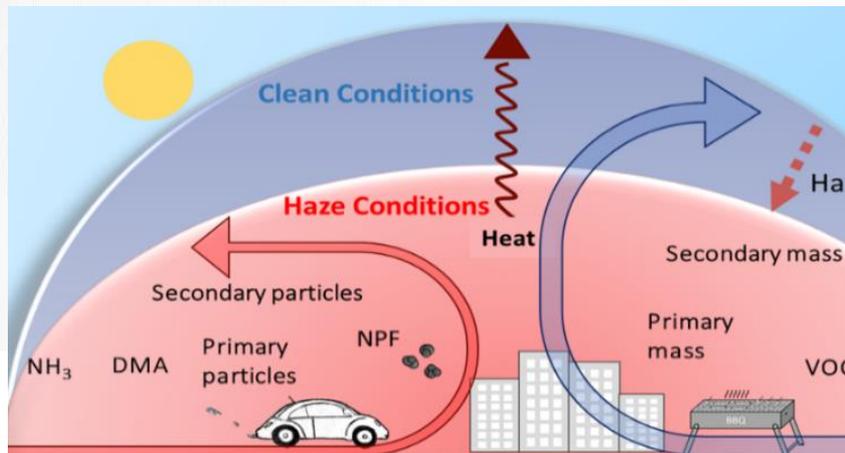
Ekaterina Ezhova<sup>1</sup>, Ilona Ylivinkka<sup>1</sup>, Joel Kuusk<sup>2</sup>, Kaupo Komsaar<sup>3</sup>, Marko Vana<sup>3</sup>, Alisa Krasnova<sup>4</sup>, Steffen Noe<sup>4</sup>, Mikhail Arshinov<sup>5</sup>, Boris Belan<sup>5</sup>, Sung-Bin Park<sup>6</sup>, Jost Valentin Lavric<sup>6</sup>, Martin Heimann<sup>1,6</sup>, Tuukka Petäjä<sup>1</sup>, Timo Vesala<sup>1,7</sup>, Ivan Mammarella<sup>1</sup>, Pasi Kolar<sup>1</sup>, Jaana Bäck<sup>7</sup>, Üllar Rannik<sup>1</sup>, Veli-Matti Kerminen<sup>1</sup>, and Markku Kulmala<sup>1</sup>



# RESEARCH – RUSSIA FUTURE STEPS

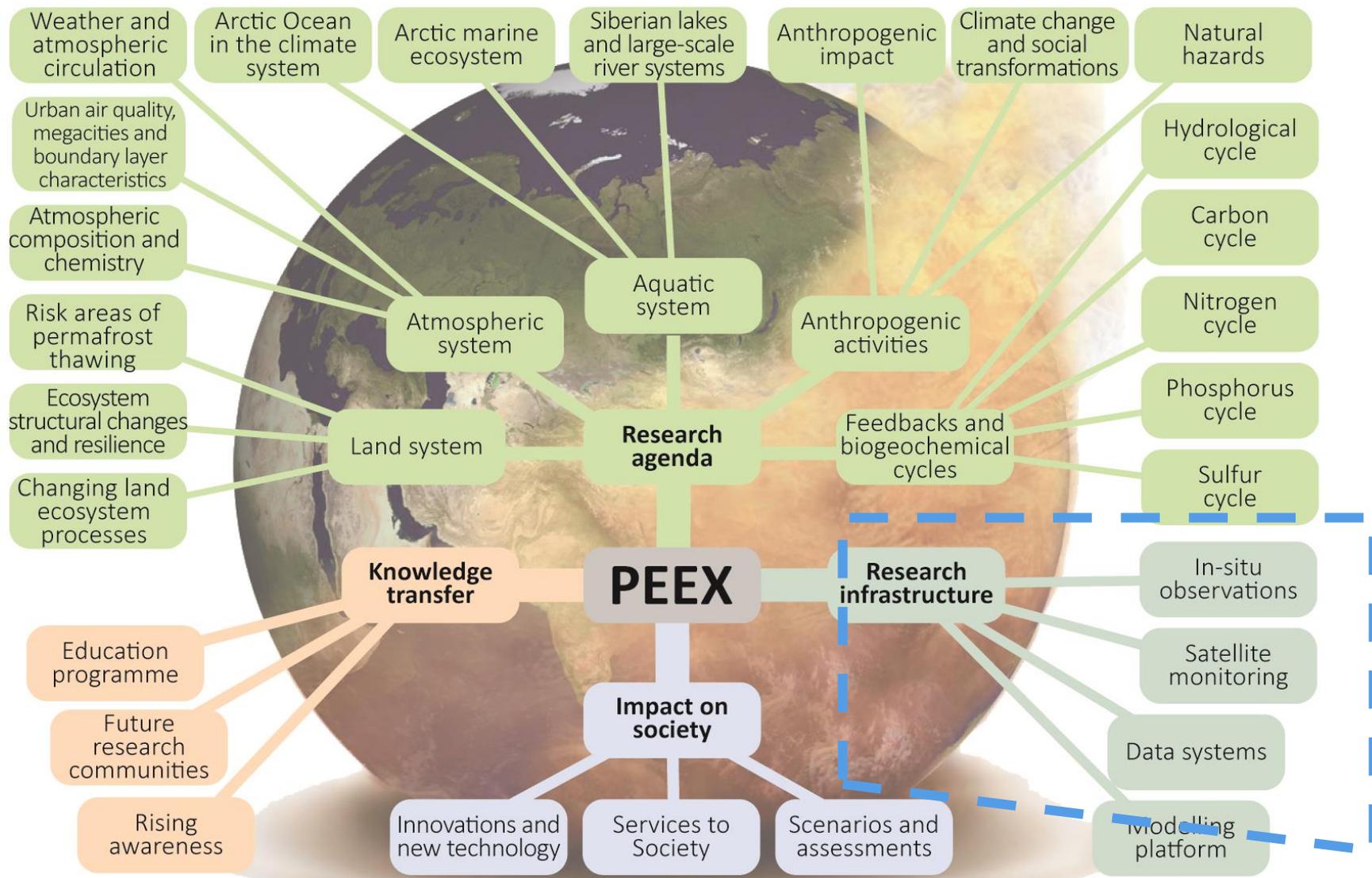


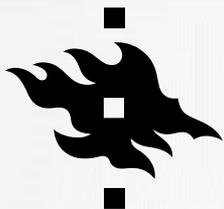
- to establish super station for continuous comprehensive SMEAR type observations ([Kulmala, Petäjä et al.](#))
- to find out proper feedback loops, to quantify formation and urban heat island – air pollution – boundary layer dynamics interactions and feedbacks





# RESEARCH INFRASTRUCTURE





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Pan-Eurasian Experiment

PEEX



# Vision: Global observation network

Existing stations in Russia; **THERE IS A NEED FOR ADVANCED IN SITU STATIONS IN THE NORTHERN EURASIA / PEEX REGION**

**M. Kulmala: Nature Comment,  
Nature 553, 21–23 4 Jan 2018)**

The answer is a global Earth observatory — 1,000 or more well-equipped ground stations around the world that track environments and key ecosystems fully and continuously

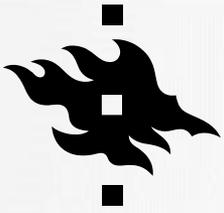
- Researchers could find new mechanisms and feedback loops in this coherent data set
- Policymakers could test policies and their impacts
- Companies could develop environmental services



An enclosure for measuring gas exchange between plants and the atmosphere at a station in Finland.

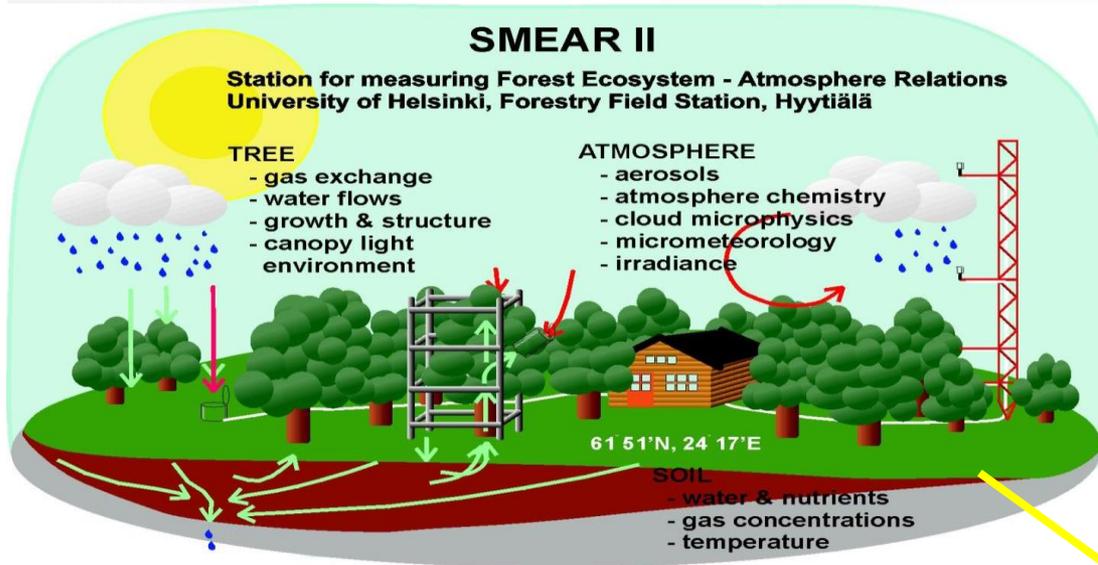
## Build a global Earth observatory

Markku Kulmala calls for continuous, comprehensive monitoring of interactions between the planet's surface and atmosphere.



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# CONTINUOUS, COMPREHENSIVE OBSERVATIONS

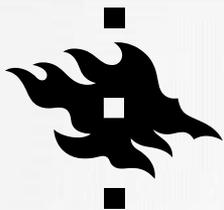


**SMEAR II-STATION  
AT THE BOREAL FOREST, COUNTRY  
SIDE**

**Over 1200  
different  
variables**



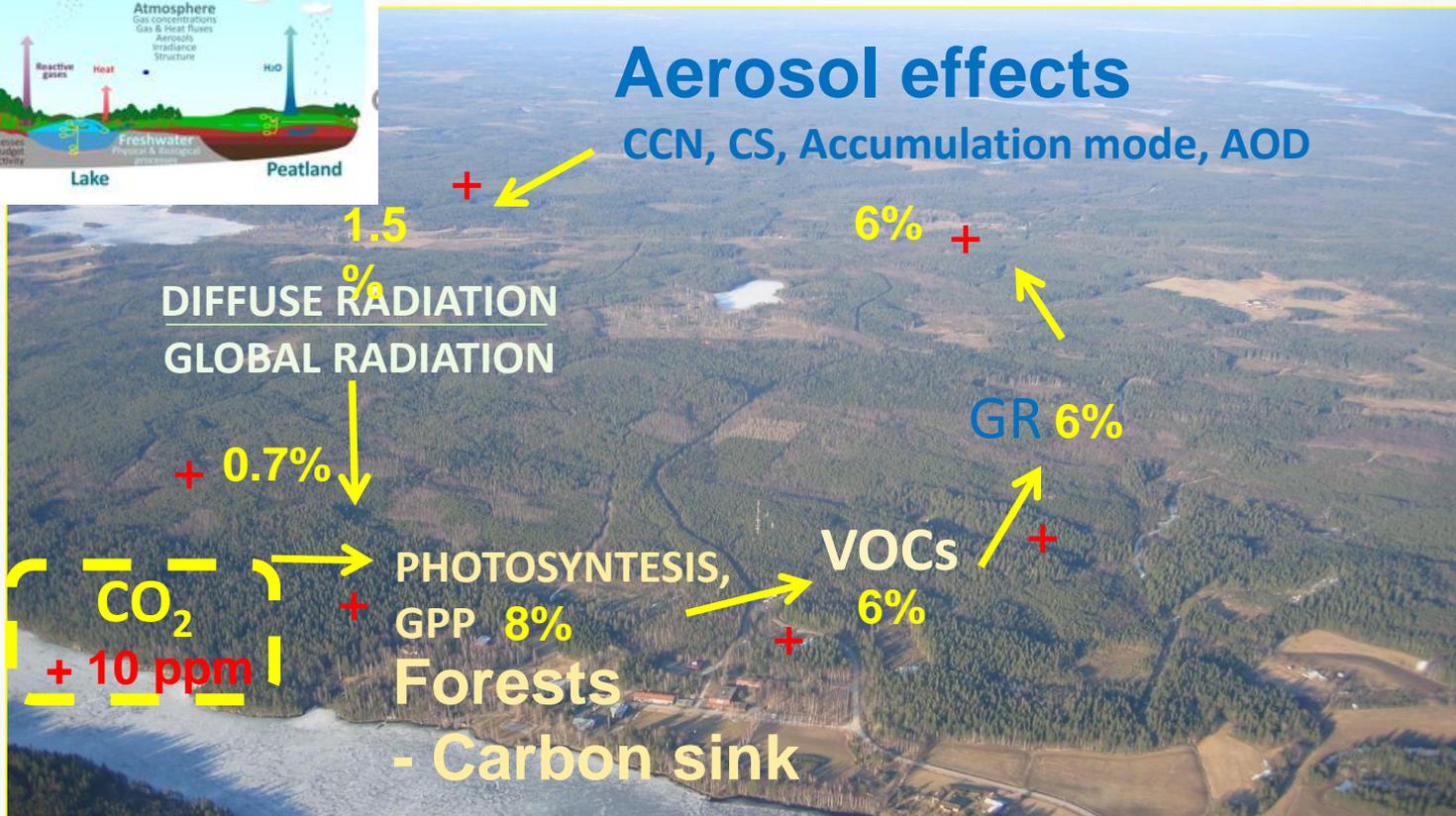
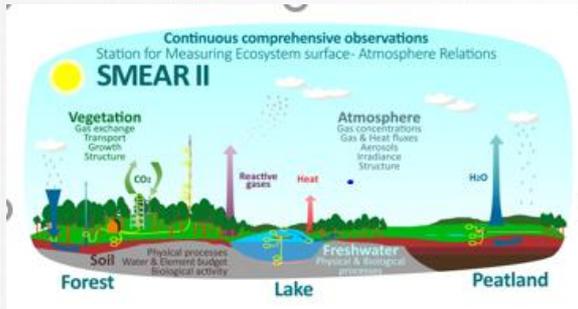
**Site for ICOS, ACTRIS, eLTER, INGOS, EXPEER, ANAEE,  
LifeWatch, WMO, EMEP, CARBOEUROPE, NITROEUROPE,  
EUCAARI, PEGASOS**



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# FROM ATMOSPHERIC CLUSTERING TO GLOBAL CLIMATE AND AIR QUALITY

**SMEAR II: 1996-2009**

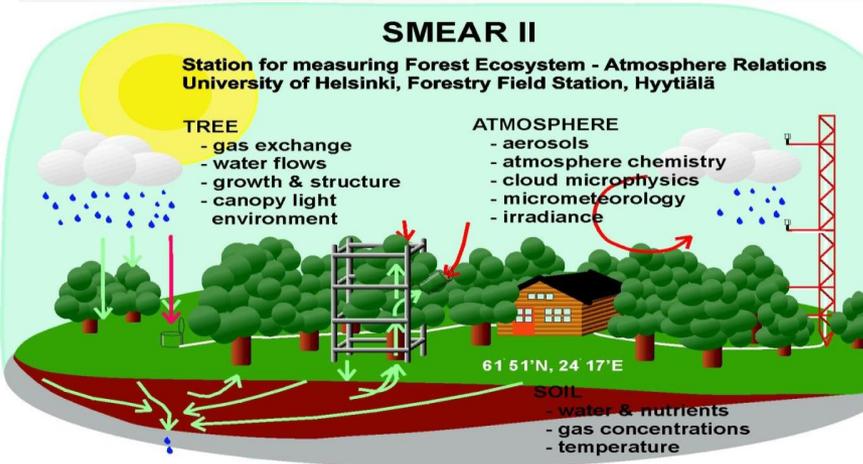


*Kulmala et al., 2014, BER*



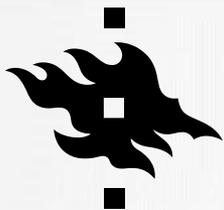
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## CONTINUOUS COMPREHENSIVE MEASUREMENTS : POWERFUL TOOL



# SMEAR CONCEPT

- **Trends** in measured concentrations and fluxes, Statistics (temporal and spatial variability)
- **Process** dynamics and partitioning
- **Feedbacks** between processes and compartments
  - Soil-forest-atmosphere
  - Forest-soil-streams-lake
  - Atmosphere-forest-soil
- **Examples**
  - From carbon sink to aerosol source
    - **CarbonSink+**
  - New Particle Formation
  - Climate issues



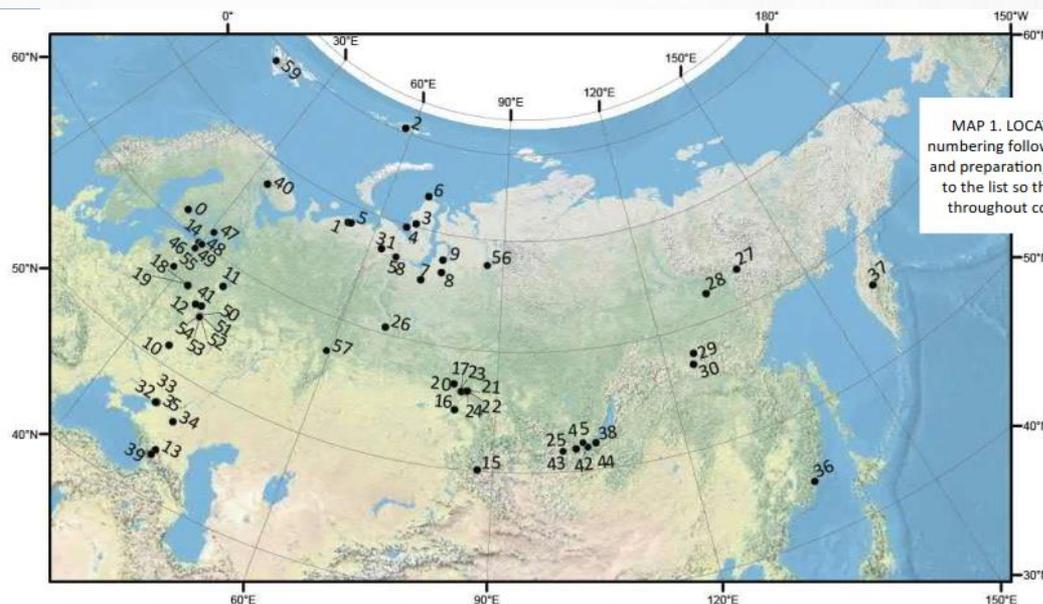
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Pan-Eurasian Experiment  
**PEEX**



- introducing the existing observation capacity
  - enhance rereach collaboration & data exchange
  - stations to be upgraded towards SMEAR concept ?



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



PAN-EURASIAN EXPERIMENT  
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*In-Situ Atmospheric-Ecosystem  
Collaborating Stations-Russian Federat*  
**e-CATALOGUE 2018**

- |                              |                              |                           |                          |
|------------------------------|------------------------------|---------------------------|--------------------------|
| 0 Hyytiälä                   | 10 Kursk BS                  | 20 Vasyuganie             | 30 Lookuchakit           |
| 1 Kashin                     | 11 Borok GO                  | 21 IMCES GO               | 31 Seida-Vorkuta         |
| 2 Heiss                      | 12 Zvenigorod SS             | 22 Siberian Lidar Station | 32 Donskoy               |
| 3 Vaskiny Dachi              | 13 Kislovodsk HMS            | 23 Tomsk, site Kireevsk   | 33 Kagalnik              |
| 4 Marre-Sale Weather Station | 14 Peterhof                  | 24 Tomsk, site Tomsk      | 34 Manych                |
| 5 Bolvansky                  | 15 Aktru                     | 25 Tory                   | 35 Vzmorje               |
| 6 Belyy                      | 16 Novosibirsk MIS           | 26 Mukhrino               | 36 Smychka               |
| 7 Nadym                      | 17 Fonovaya                  | 27 Lazurnaya              | 37 Bolgyt                |
| 8 Urengoy FT                 | 18 Okovskiy forest RyFyo:bog | 28 Chyappara              | 38 Istomino              |
| 9 Urengoy T                  | 19 Okovskiy forest RyFyo     | 29 Tajezhka               | 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)   |

# COLLABORATION WITH PEEX RUSSIAN PARTNERS

## Pan-Eurasian Experiment

### PEEX

# Horizon2020 iCUPE project

**iCUPE** Integrative and Comprehensive Understanding on Polar Environments  
ERA-PLANET strand 4

### Urban Heat Island Arctic Research Campaign (UHIARC) dataset



Pavel Konstantinov, Lomonosov Moscow State University (MSU)  
Mikhail Varentsov, Lomonosov Moscow State University (MSU)  
Alexander Bakianov, World Meteorological Organization (WMO)  
Igor Etzu, Nansen Environmental & Remote Sensing Center (NERSC)  
E-mail: kostadini@mail.ru  
Moscow, 1 September 2018

iCUPE Collaborators Datasets

DS on micro-climatic features and Urban Heat Island Intensity in cities of Arctic region

Document version number: 1

Absence of a dense meteorological network impedes development of urban climatology in the northern polar region where the global warming is rapid and amplified. High quality and density urban temperature datasets are

February 2nd to March 15th of 2017 in the .csv format after registration on the server. Current dataset includes temperature measurement data of pairs of stations (urban and rural) for three cities (Vorkuta, Salekhard and

**iCUPE** Integrative and Comprehensive Understanding on Polar Environments  
ERA-PLANET strand 4

### Monitoring, modeling and assessment of potential sources, dynamics and atmospheric transport for low and elevated mercury concentrations in Arctic regions



Fidel Pankratov, Institute of Northern Environmental Problem, Kola Science Centre of the Russian Academy of Sciences (INEP KSC RAS)  
fidel\_ru@mail.ru  
Moscow, 23.04.2018

iCUPE Collaborators Datasets

DS on atmospheric mercury measurements at Amerdama station

Document version number: 1

The development of a model for the dynamics of mercury (Hg) in the surface layer of the atmosphere is logical extension of the long-term monitoring of Hg in Russian Arctic. The Hg input from the southern and middle latitudes to the Arctic will be assessed using the long-term high-resolution data (concentrations of elemental Hg in the atmosphere with a resolution of 1 hour from 2001 to the present, as well as the meteorological parameters (temperature, wind direction, humidity) with a resolution of 3 hours). Model of the global mercury transport in atmosphere of the northern hemisphere and especially in the Arctic atmosphere will also be tested. These data will be used to calculate the deposition rates of mercury to the underlying tundra surface, and uptake of the organic forms of mercury through biological chains will be assessed subsequently.

At the polar station Amerdama the phenomenon of the atmospheric mercury depletion events (AMDEs) was confirmed using the long-term monitoring data. The unique experiment when the atmospheric mercury collection point during the long-term monitoring was consequently moved from the mainland to the coast line of the Kara Sea fixed the increasing number of the AMDEs. The results obtained will be helpful in better understanding of the mercury behavior in the Arctic region.

The obtained long-term monitoring data at the Amerdama station are compared with the results of measurements made at other International Polar Stations. High convergence of the results is shown for all polar stations.

The volcanic eruptions in Iceland are identified as the cause of the unusually high atmospheric mercury concentrations in the background layer at the Amerdama Station. These data can be used to identify and evaluate local anthropogenic and natural sources that affect Arctic pollution.

#### References

- Pankratov F.F., Mahura A., Popova V., Ratz D.V. Dynamics of atmospheric mercury in the Russian Arctic depending on the measurement position versus season. // Extended abstracts and Poster, Atmospheric Sciences, The 3rd Pan-Eurasian Experiment (PEEX) Science Conference & The 5th PEEX Meeting (Helsinki), Finland 10-18 February 2015. <http://www.atm.helsinki.fi/AAR/Report/abstracts/2015.pdf>, pp. 324-329.
- Pankratov F., Mahura A., Popov V., Ratz D. Long-term continuous monitoring of mercury in the Russian Arctic: winter increase of atmospheric mercury depletion events. // Synthesis and Poster, Atmospheric Sciences, Pan-Eurasian Experiment (PEEX), European Geosciences Union, General Assembly 2014, April 27-30 May, 2014, Vienna, Austria. Abstract. <http://meetingorganizer.copernicus.org/EGU2014/EGU2014-10204>
- Pankratov F. Dynamics of atmospheric mercury in the Russian Arctic. Thesis, November 2015, DOI: 10.21203/rs.1.rs1255.2767.3

**iCUPE** Integrative and Comprehensive Understanding on Polar Environments  
ERA-PLANET strand 4

### Measurements of Elemental and Organic Carbon in Atmospheric Aerosols: Kandalaksha Bay of the White Sea



Vladimir Shevchenko, P.P. Shirshov Institute of Oceanology, Russian Academy of Sciences  
vshvch@ocean.ru  
Moscow, 1 March 2018

iCUPE Collaborators Datasets

DS on elemental and organic carbon over the northwestern coast of the Kandalaksha Bay of the White Sea

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ERA-PLANET strand 4

### Comprehensive monitoring of the atmosphere at Fonovaya Observatory, West Siberia



Boris Belan, V.E. Zuev Institute of Atmospheric Optics, Russian Academy of Sciences, Siberian Branch (IAO SB RAS)  
bbel@iao.ru

Tomsk, 26 August 2018

iCUPE Collaborators Datasets

DS on atmospheric composition at Fonovaya Observatory, West Siberia

Document version number: 1

To date, it is evident that for better understanding the current and future state of the climate system, it is necessary to establish as many observation stations as possible all around the world especially in areas currently sparsely covered (Kulmala, 2018). Taking into account possible climate feedback loops involving not only greenhouse gases (GHG) but a number of other trace gas species and atmospheric constituents, observations should be comprehensive (Kulmala, et al., 2014). Russia occupies a significant part of the land surface of the Northern Hemisphere, but its observational infrastructure is still weak.

Taking into account the importance of the existing problem and the absence of background observation stations in West Siberia operating in continuous measurement regime, the IAO SB RAS decided to establish its background monitoring station at the Fonovaya Observatory that is situated on the east bank of the River Ob, 60 km west of Tomsk (56°25'07" N, 84°04'27" E; Figure 1). At the moment, its observational facilities allow the following parameters to be measured: concentration of atmospheric CO<sub>2</sub>, CH<sub>4</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, O<sub>3</sub>; GHG fluxes from soil using static chambers; aerosol size distribution; black carbon (BC) and basic meteorological variables. Near real-time (NRT) visualization is available at: [http://lap.iao.ru/EN/lon\\_gas](http://lap.iao.ru/EN/lon_gas).



Figure 1. Fonovaya Observatory (indicated by arrow)

#### References

- Belan B. et al., 2018. Fonovaya Observatory for comprehensive atmospheric monitoring in West Siberia: current status and future needs. Abstracts of the ESU General Assembly 2018, 8-13 April 2018, Vienna, Austria. <https://meetingorganizer.copernicus.org/ESU2018/EGU2018-6383-1.pdf>
- Kulmala M., 2018. Built a global Earth observatory. Nature 557(7680), 21-23.
- Kulmala M. et al., 2014. CO<sub>2</sub>-induced terrestrial climate feedback mechanism: from carbon sink to aerosol source and back. *Barcel. Env. Res.* 19 (suppl. 8) 122-131.

**“Integrative and Comprehensive Understanding on Polar Environments” (2018-2020)**

[www.atm.helsinki.fi/icupe](http://www.atm.helsinki.fi/icupe)

**PI Prof. T. Petäjä INAR Univ.Hel + MSU, KolaSC, IAO SB RAS, ShIO RAS (as collaborator contribution with our datasets)**

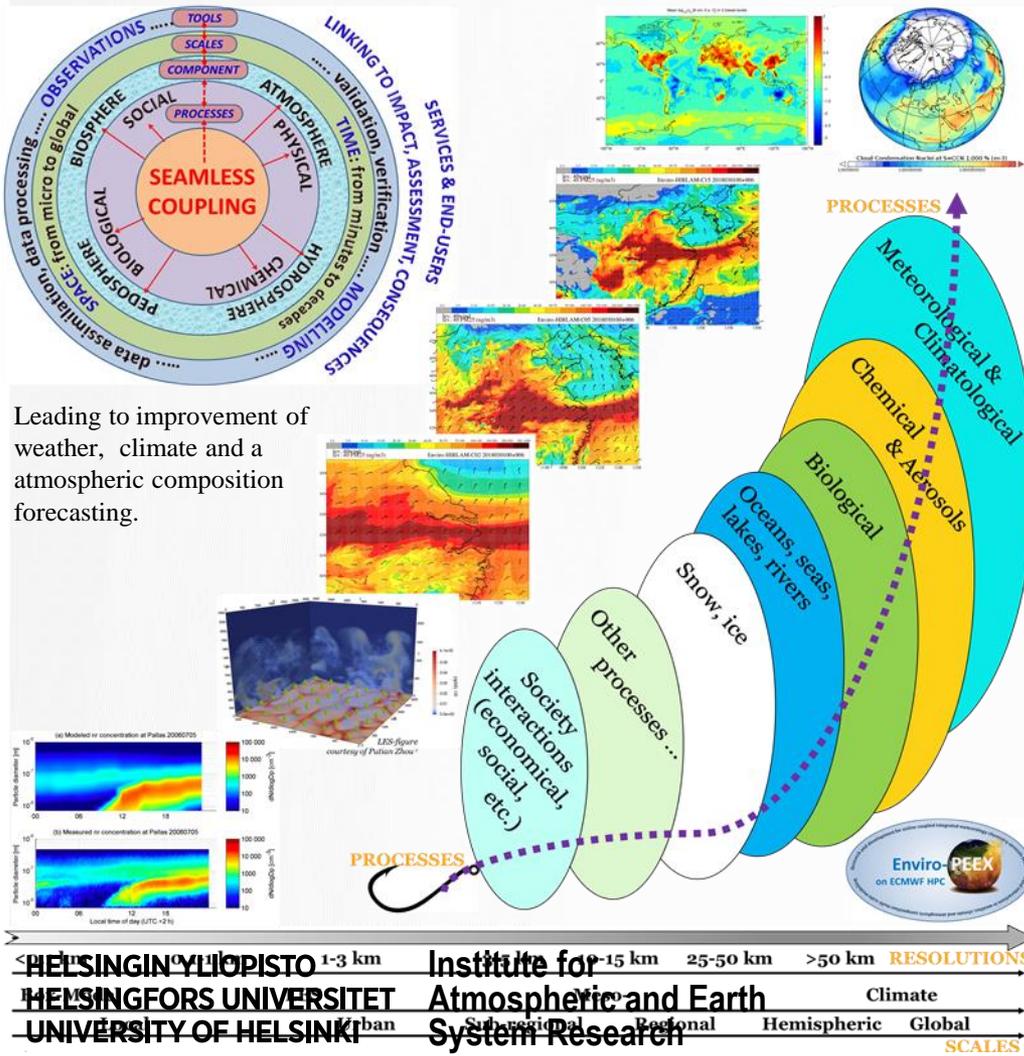
**Info-teasers for datasets:**  
[www.atm.helsinki.fi/icupe/index.php/datasets/submitted-datasets](http://www.atm.helsinki.fi/icupe/index.php/datasets/submitted-datasets)

# COLLABORATION WITH PEEEX RUSSIAN PARTNERS



Pan-Eurasian Experiment  
**PEEX**

## Enviro-PEEX on ECMWF project



Leading to improvement of weather, climate and a atmospheric composition forecasting.

*“PEEX-MP research and development for online coupled integrated meteorology-chemistry-aerosols feedbacks & interactions in weather, climate & atmospheric composition multi-scale modelling”*

(2018-2020)

[www.atm.helsinki.fi/peex/index.php/enviro](http://www.atm.helsinki.fi/peex/index.php/enviro)

+ **MSU, RSHU, ICMMG, NIERSC**

### Objectives:

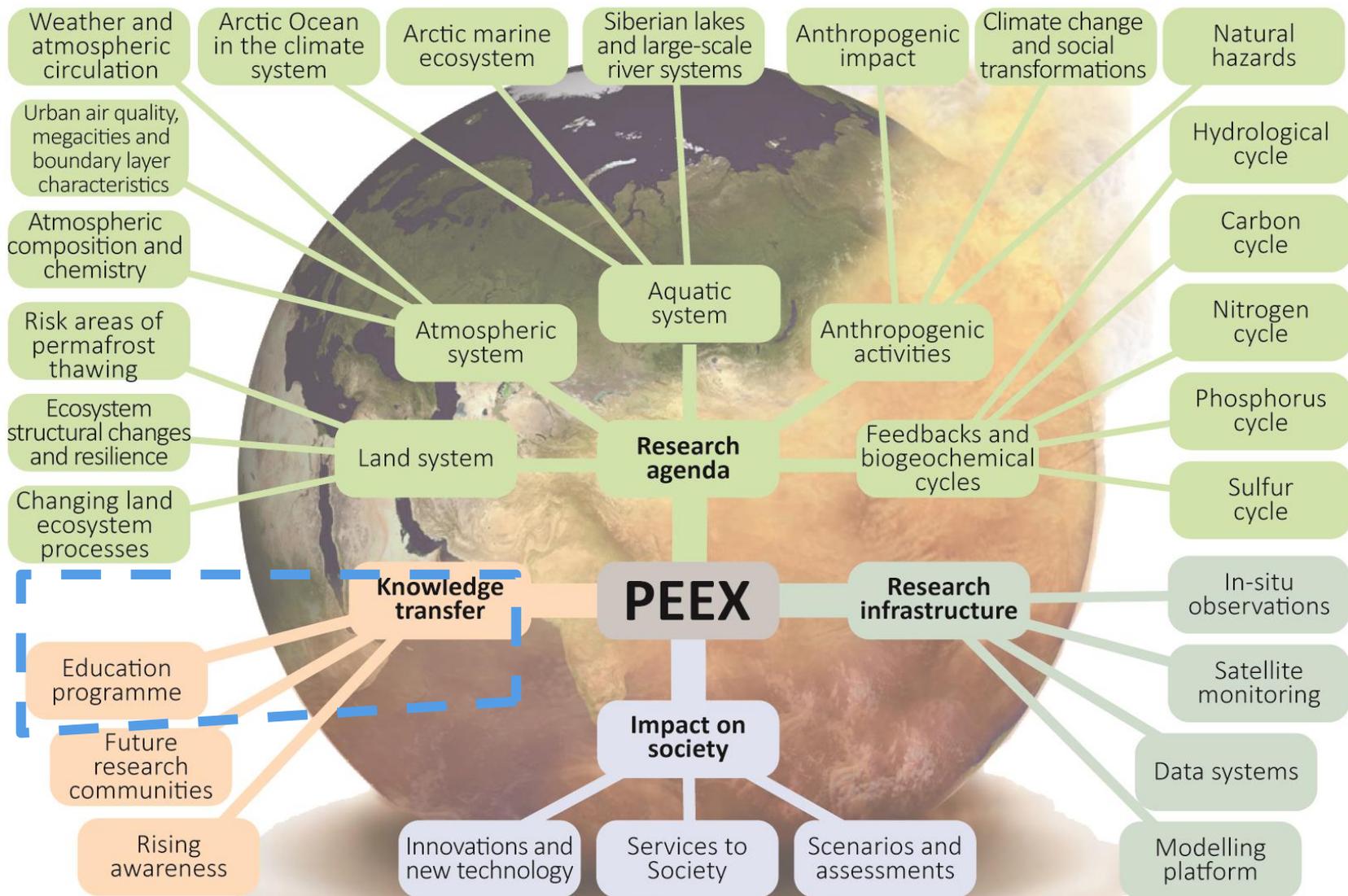
- to analyze importance of meteorology-chemistry-aerosols interactions & feedbacks;
- to provide a way for development of efficient techniques for on-line coupling of NWP and ACT via process-oriented parameterizations and feedback algorithms.

HELSINGIN YLIOPISTO  
HELSINGFORS UNIVERSITET  
UNIVERSITY OF HELSINKI

Institute for Atmospheric and Earth System Research

1-3 km 3-15 km 25-50 km >50 km RESOLUTIONS

Urban Sub-regional Regional Hemispheric Global SCALES





Pan-Eurasian Experiment

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For teachers:  
Organize, propose, coordinate education  
activities with us. Contact PEEEX  
Headquarters, [peex-hq@helsinki.fi](mailto:peex-hq@helsinki.fi)

**JOIN THE FLOW!**

2019, October 14-25 Autumn school  
“Analysis of atmosphere-surface interactions  
and feedbacks”  
Hyttälä, Finland; hosted by Univ Helsinki

2020, April 20-25 PEEEX-Academic Challenge  
“Multi-scale and –processes modelling for  
environmental applications”  
St.Petersburg, Russia; hosted by Russian  
State Hydrometeorological University

2020 May 26-28 Erasmus+ MODEST project  
workshop/ training on University science  
education (in preparation)  
Hyttälä, Finland; hosted by Univ Helsinki

2020 27 July – 7 August Young Scientist  
Summer School (YSSS) on “Multi-Scales and  
–Processes Integrated Modelling,  
Observations and Assessment for  
Environmental Applications” with AoF  
ClimEco & RSF MegaCity projects. Moscow,  
Russia; hosted by Moscow State University

# PEEX EDUCATION ACTIVITIES

**Intensive and term courses**  
**PhD and MSc programs**  
**On-line education, MOOCs**  
**Educational resources**

**Projects: Erasmus+MODEST  
FIRST+PEEX-AC**

**For students:**  
**Follow the course offer and details**  
**from PEEEX Newsletter and PEEEX**  
**web site**

**For teachers:**  
**Organize, propose, coordinate**  
**education activities with us.**

2016 March Winter school "Atmospheric aerosols and their interactions" Helsinki, Finland

2016 August Summer school "Formation and growth of atmospheric aerosols" Finland

2016 August Summer school "Boreal wetlands: from plant biodiversity and ecophysiology to biogeochemical cycles and greenhouse gases budgets" Russia

2016 Autumn Term course "Introduction to modern atmospheric science" University of Helsinki

2017 March MOOC "Atmospheric processes and aerosols & Atmosphere-surface interactions" Finland

2017 August Term course "Introduction to modern atmospheric science: Look on air quality in China" University of Helsinki

2018 June Summer course "Steps in atmospheric modeling" Helsinki, Finland

2018 June Summer school "Atmospheric aerosol physics, measurements, and modeling" Helsinki, Finland

2018 October Autumn course "Analysis of surface interactions and feedback" Finland

2018 May Summer school "Atmospheric aerosol physics, measurements, and modeling" Helsinki, Finland

2019 May Summer school "Atmospheric Aerosol Physics, Measurement, Sampling" Finland

2019 March Winter school "Advanced analysis of atmosphere-surface interactions and feedbacks" Finland

2019 June Erasmus+ MODEST workshop/ training "PhD education programmes" Finland

2019-2020 Project PEEEX-AC "Pan-Eurasian Experiment – Academic Challenge Network"

Continuous Resource Carbon Tree University of Helsinki

Continuous MOOC Climate Now University of Helsinki

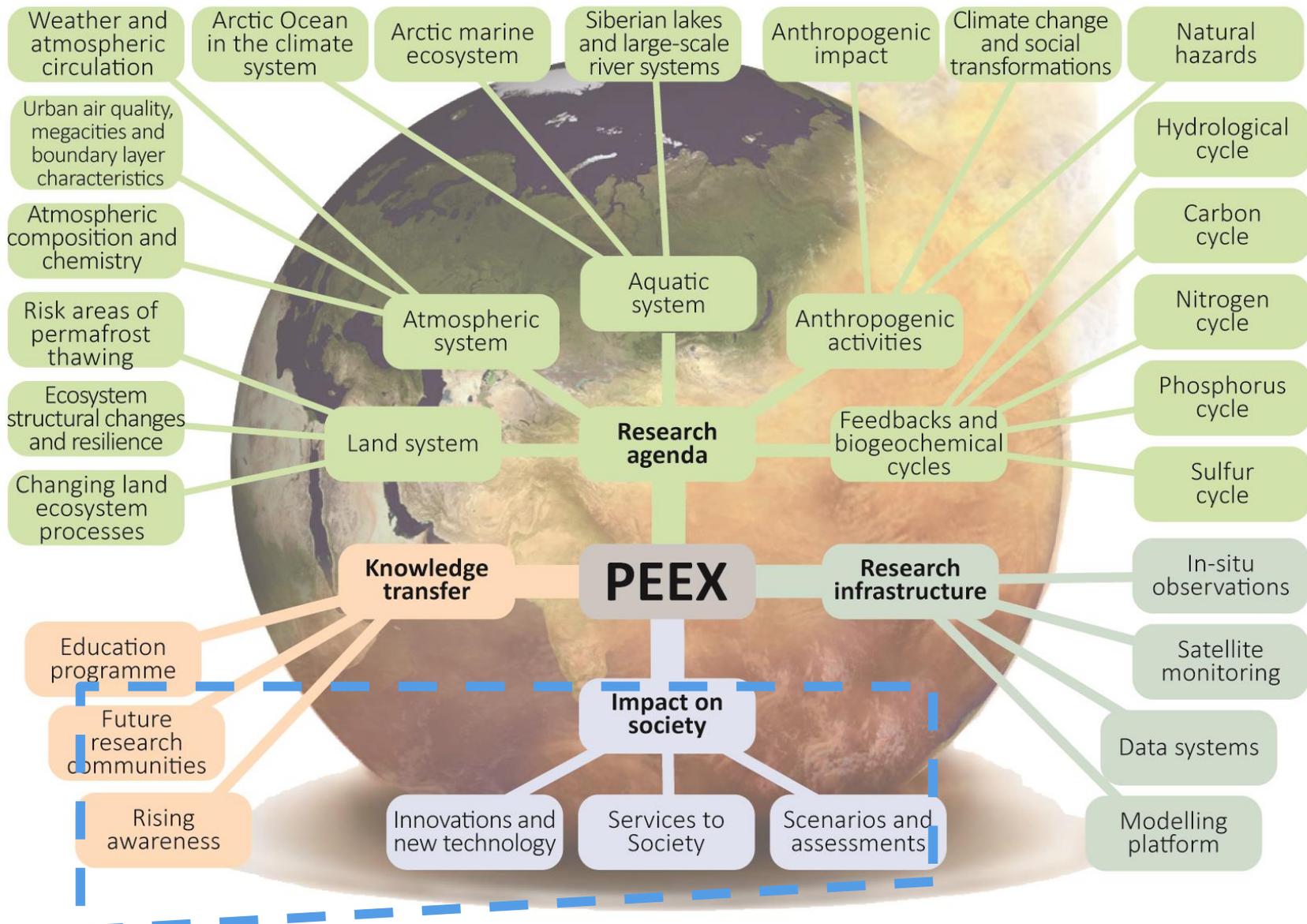
Project MODEST "Modernization of Doctoral Education in Science and Improvement Teaching Methodologies"

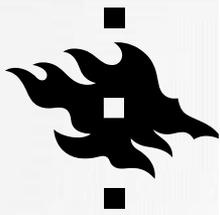
Young scientist school "Paleolimnology of Northern Eurasia" Russia

Environmental observations, modeling and information systems

**Alexander.mahura@helsinki.fi**

*“we need to learn  
together, to research  
together, and to save  
the environment,  
where we live  
together.”*





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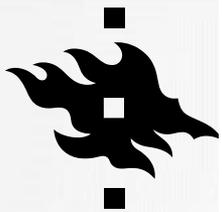
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# PEEX IMPACT ON SOCIETY

- Active in the international frameworks
  - Next event "Arena for the gap analysis of the existing Arctic Science Co-Operations AASCO" in Monaco 2020, sponsored by Prince Albert Foundation
- Sofia Earth Forum process for the dialog
  - Sofia Earth Forum 16-17.June.2019.postponed
  - Collaboration with International Eurasian Academy of Sciences (IEAS) – European Center





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