
INAR
INSTITUTE FOR ATMOSPHERIC AND EARTH SYSTEM RESEARCH
FOR THE ONLY PLANET WE HAVE
3.12.2019
HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

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INSTITUTE FOR ATMOSPHERIC AND EARTH SYSTEM RESEARCH

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Multidisciplinary research and education for atmospheric and Earth system science

Tuukka Petäjä and the INAR team

PEEX MoU Event, Helsinki

19.8. 2024

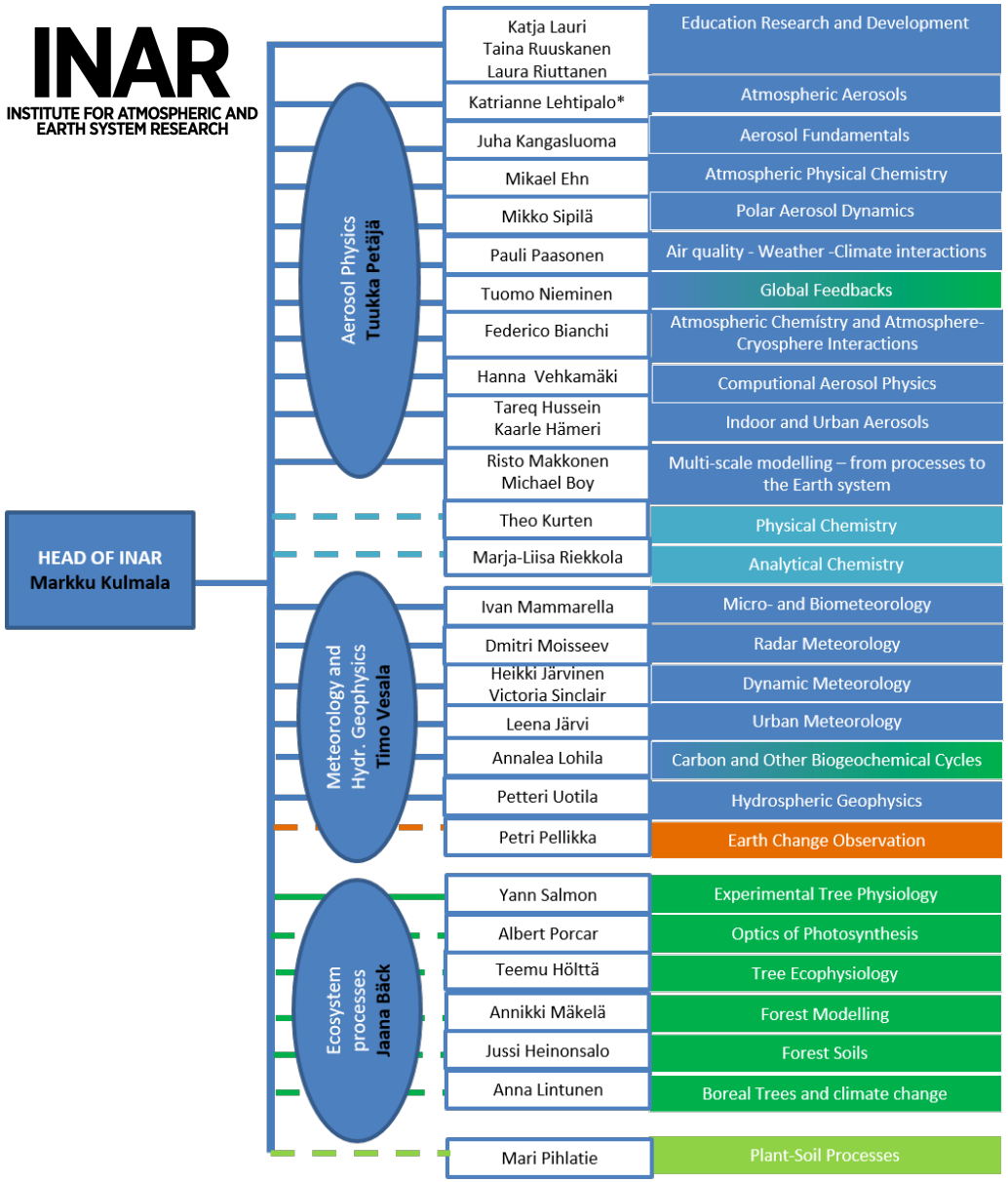
WHAT IS INAR?

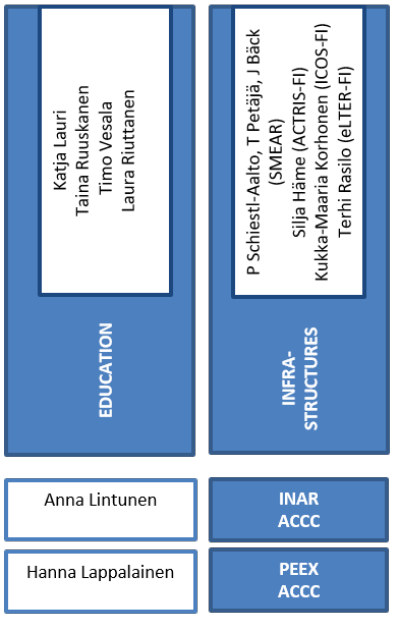
Interdisciplinary research and education Institute under the Faculties of Science and Agriculture and Forestry in the University of Helsinki

Multiscale research from molecular to global scale with a focus on climate change, air quality, biogeochemical cycles and ecosystem processes

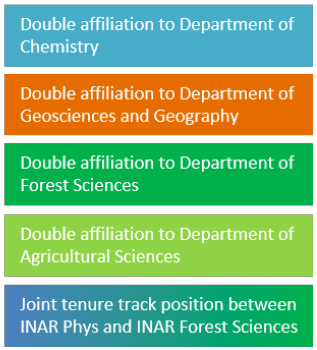
255 research, teaching and technical staff

National partners based on a contract in Finnish Meteorological Institute, University of Eastern Finland and Tampere University





* Jenni Kontkanen during Katrianne's maternity leave



A total of 255 people, 4/5 in Atmospheric sciences, 1/5 in Forestry

Reseach groups in 3 domains:

1) Aerosol physics
2) Meteorology and hydropsphere geophysics
3) Ecosystem processes

Study tracks:

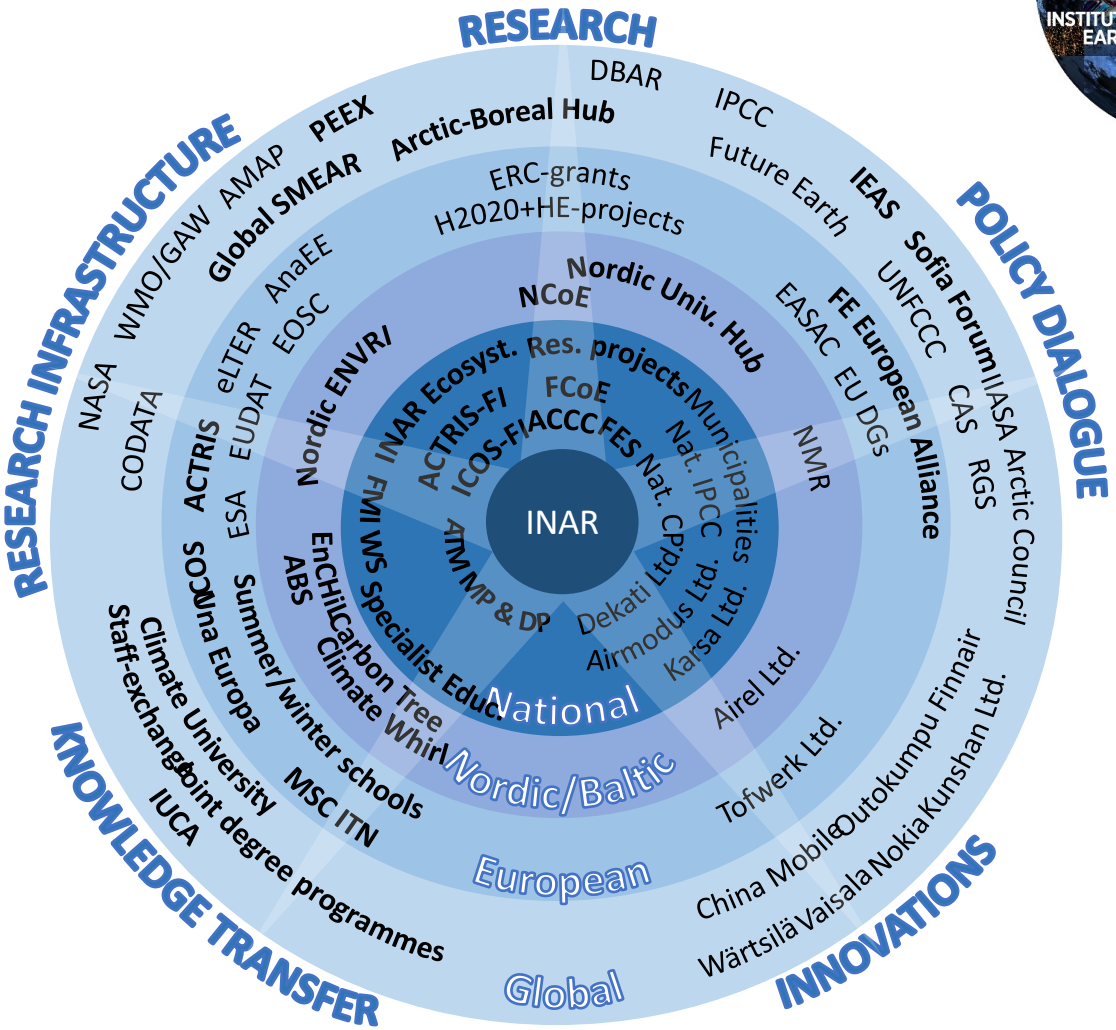
1) Bachelor programme in Physics / Bachelor program in Science / Other applicable BSc programme
2) Master program in Atmospheric sciences / Forest Sciences
3) Doctoral program in Atmospheric Sciences

CLEAR AND AMBITIOUS VISION

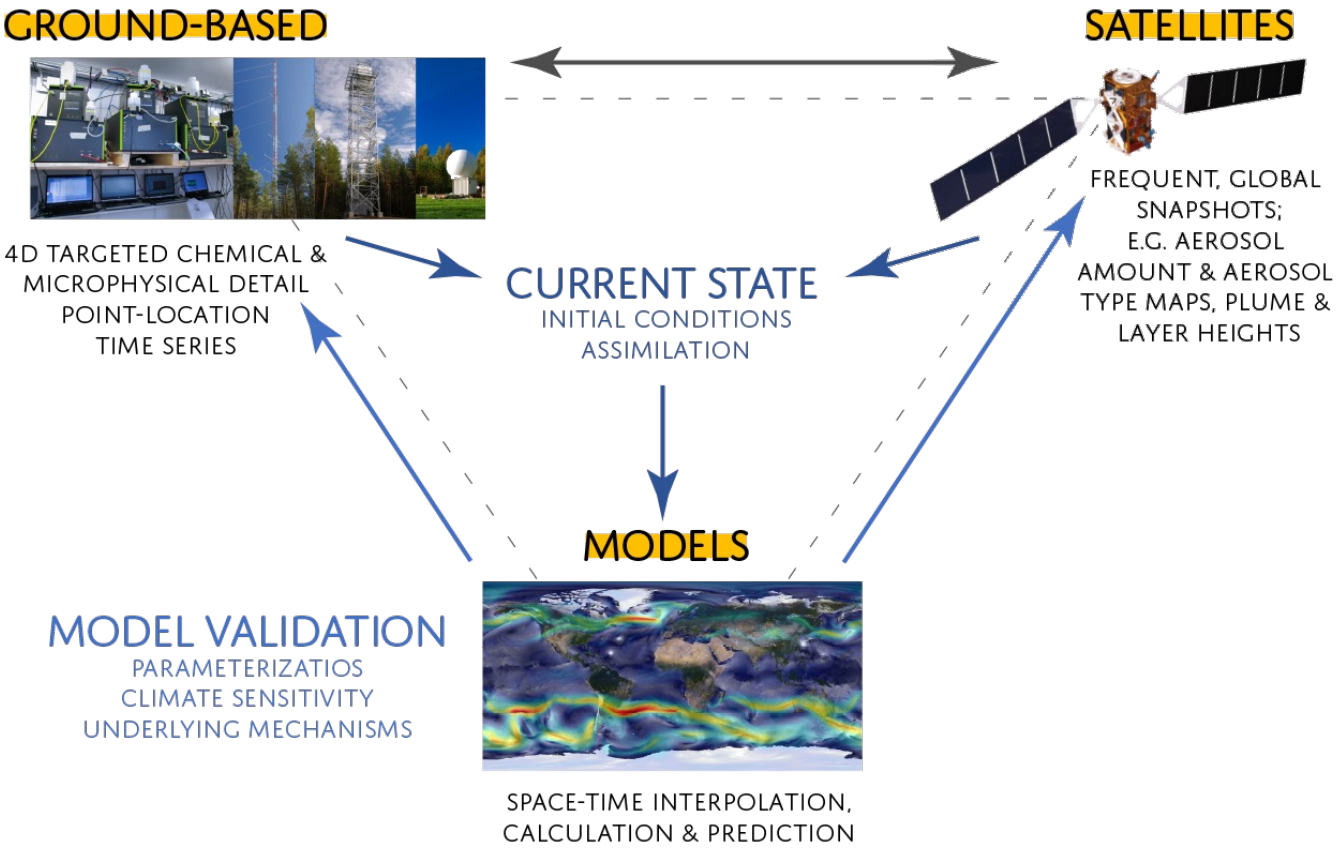
FROM DEEP UNDERSTANDING TO PRACTICAL SOLUTIONS

INAR networks and stakeholders at National, Nordic, European and global scales.

Activities that INAR or its national partners coordinate are in bold.



DEEP PROCESS UNDERSTANDING



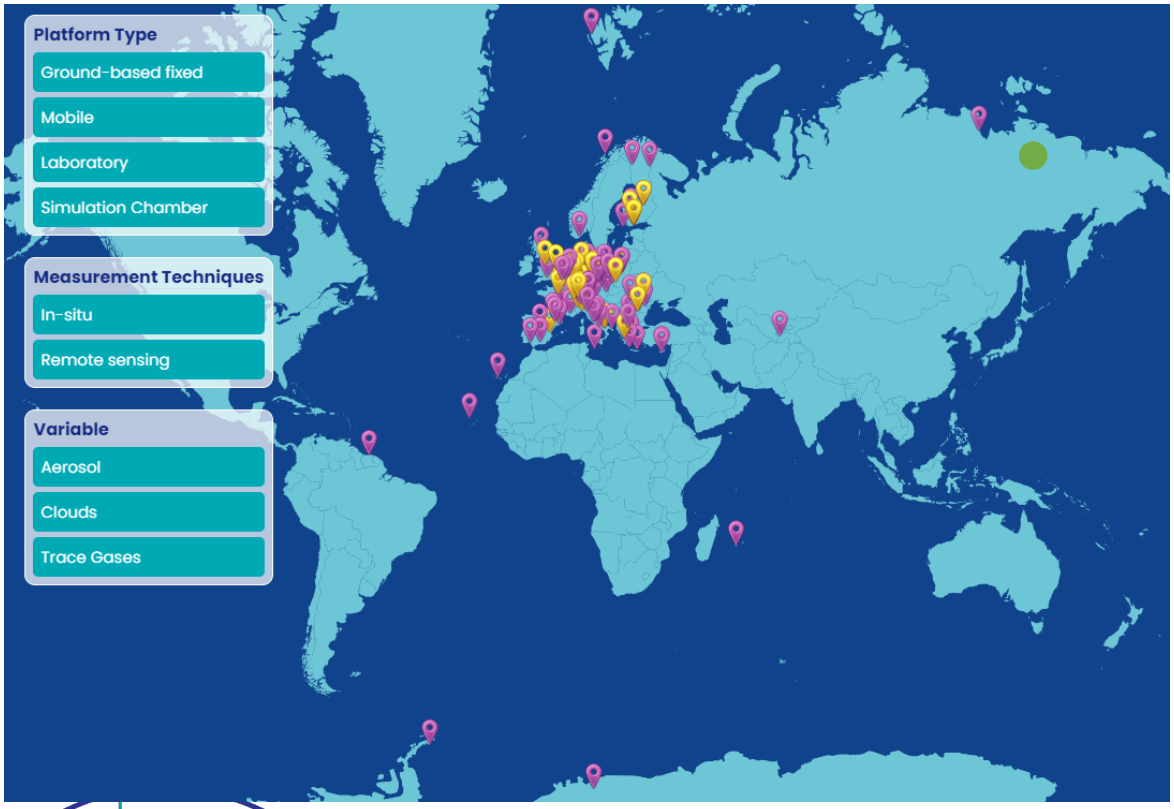
Overview: Integrative and Comprehensive Understanding on Polar Environments (iCUPE) – concept and initial results

Petäjä et al. (2021), Atmos. Chem. Phys.

- Continuous and comprehensive in situ observations in different environments, platforms and societies
- Targeted gap-filling laboratory experiments
- Applications of ground- and satellite-based remote sensing
- Multi-scale modelling
- Scientific integration and synthesis of the above

ACTRIS National Facilities

National facilities = 600 M EUR investment
Central facilities for calibration / harmonization = 100 M EUR
Head Office in Helsinki



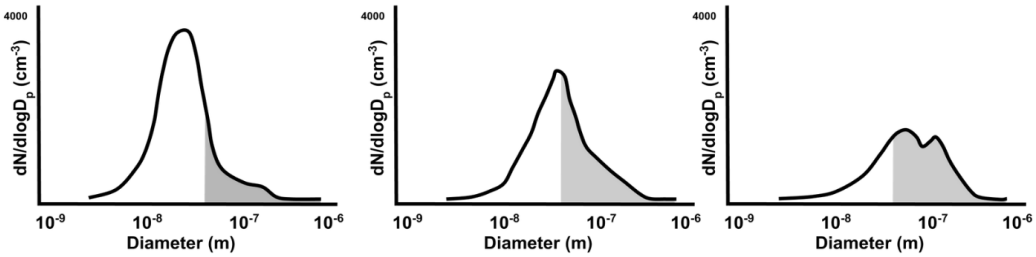
ACTRIS National Facilities

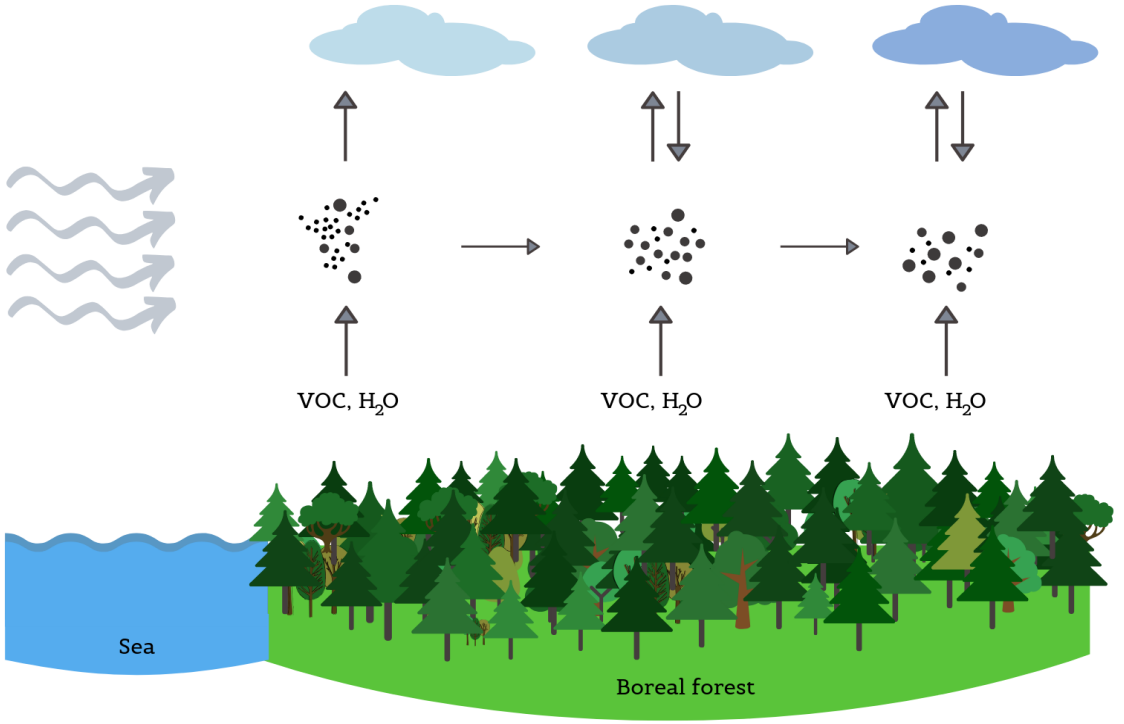
- support **long-term observations and research**
- are operated by **experts**
- make data available to users through the **ACTRIS Data Centre**
- provide key support to **knowledge transfer** to the atmospheric and climate science community.
- Currently 123 stations & platforms to be officially labelled as ACTRIS National Facilities

ARTICLES
https://doi.org/10.1038/s41561-021-00876-0
nature geoscience

Influence of biogenic emissions from boreal forests on aerosol–cloud interactions

T. Petäjä[1,2✉], K. Tabakova[1], A. Manninen[1,3], E. Ezhova[1], E. O'Connor[3,4], D. Moisseev[1,3], V. A. Sinclair[1], J. Backman[1,3], J. Levula[1], K. Luoma[1], A. Virkkula[1,2,3], M. Paramonov[1,3], M. Räty[1], M. Äijälä[1], L. Heikkinen[1], M. Ehn[1], M. Sipilä[1], T. Yli-Juuti[5], A. Virtanen[5], M. Ritsche[6], N. Hickmon[6], G. Pulik[7], D. Rosenfeld[7], D. R. Worsnop[1,8], J. Bäck[9], M. Kulmala[1,2,10,11] and V.-M. Kerminen[1]



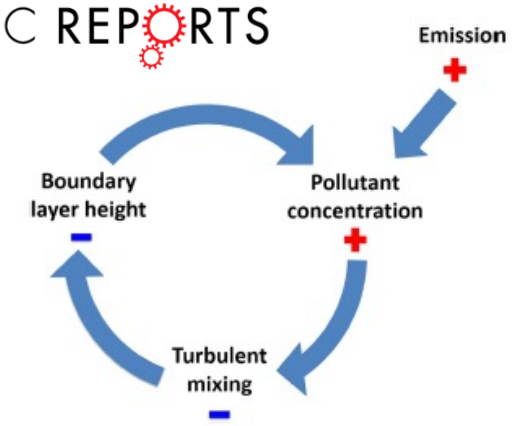


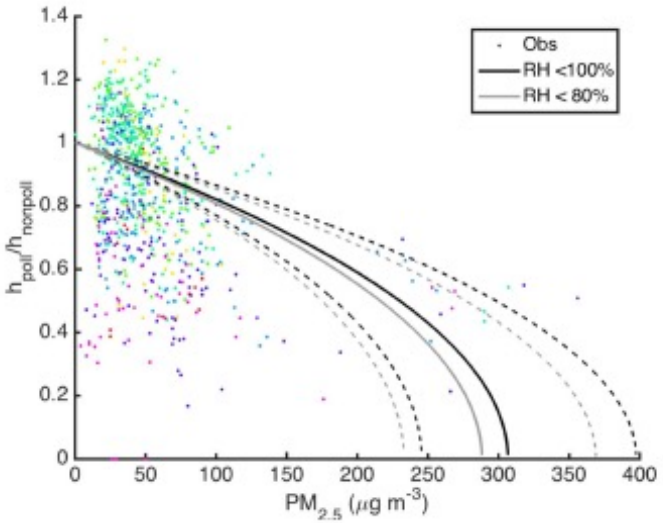
Activation to cloud droplets, precipitation

Aerosol formation, condensational growth

Atmospheric chemistry, oxidation

SCIENTIFIC REPORTS



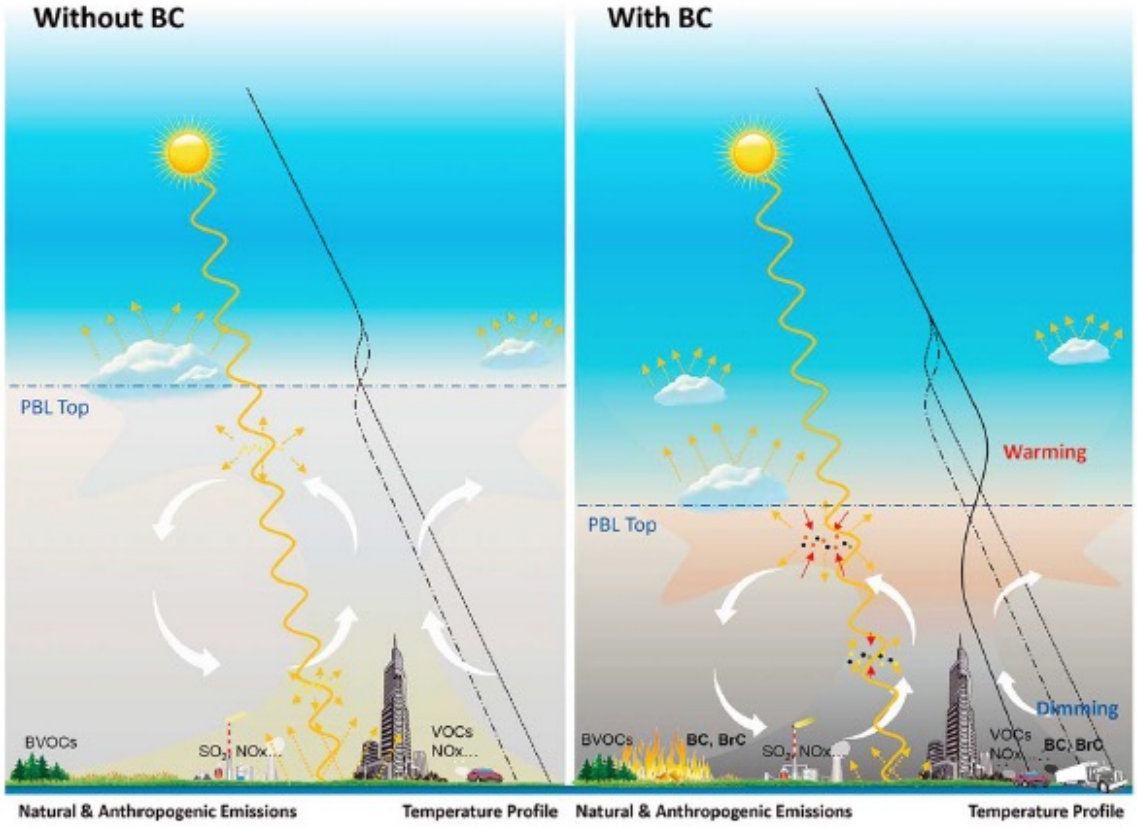


Enhanced haze pollution by black carbon in megacities in China

A. J. Ding[1,2,3], X. Huang[1,2,3], W. Nie[1,2,3], J. N. Sun[1,2,3], V.-M. Kerminen[2,4], T. Petäjä[2,4], H. Su[1,3,5], Y. F. Cheng[5], X.-Q. Yang[1,2,3], M. H. Wang[1,2,3], X. G. Chi[1,2,3], J. P. Wang[1,2,3], A. Virkkula[1,2,4,6], W. D. Guo[1,2,3], J. Yuan[1,2,3], S. Y. Wang[1,2,3], R. J. Zhang[7], Y. F. Wu[7], Y. Song[8], T. Zhu[8], S. Zilitinkevich[4,6], M. Kulmala[4], and C. B. Fu[1,2,3]

Enhanced air pollution via aerosol-boundary layer feedback in China

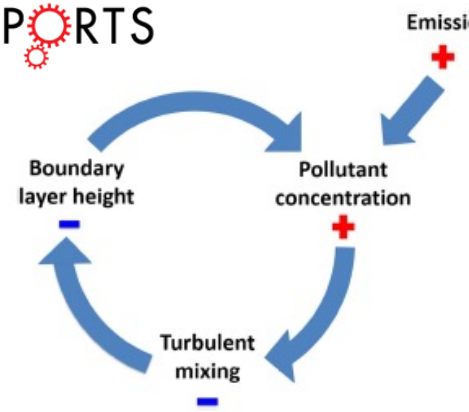
T. Petäjä[1,2], L. Järvi[1], V.-M. Kerminen[1], A.J. Ding[2], J.N. Sun[2], W. Nie[1,2], J. Kujansuu[1], A. Virkkula[2,3], X.-Q. Yang[2], C.B. Fu[2], S. Zilitinkevich[1,3,4,5,6] & M. Kulmala[1]



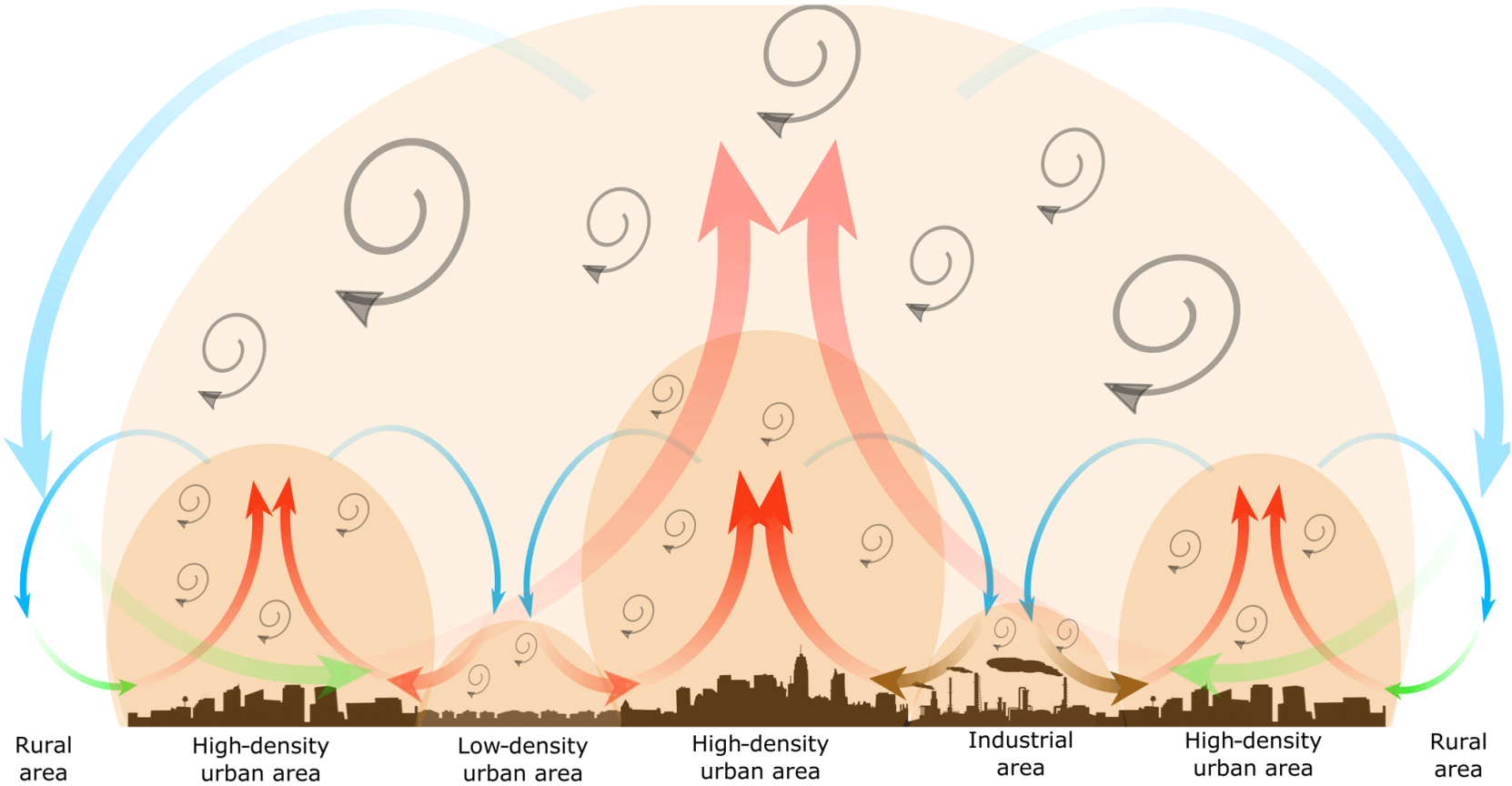
Opinion: Gigacity – a source of problems or the new way to sustainable development

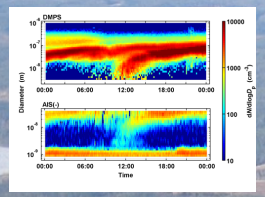
Markku Kulmala[1,2,3], Tom V. Kokkonen[1,2], Juha Pekkanen[4,5], Sami Paatero[2], Tuukka Petäjä[1,2,3], Veli-Matti Kerminen[2], and Aijun Ding[1]

Atmospheric Chemistry and Physics
SCIENTIFIC REPORTS



Petäjä et al. 2016





SMEAR II station
(boreal) 1995 -

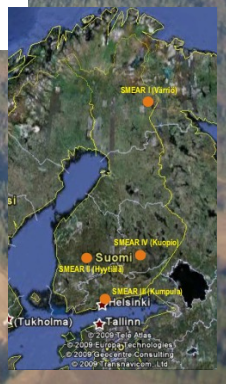
Main message:

1) **Commitment to comprehensive and continuous environmental observations**

2) **Continuous method development (instrumentation, models)**

3) **Active and open collaboration across various boundaries**

4) **Willingness to tackle and solve grand challenges together**



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RI URBANS

European Commission

ATMO ACCESS
Access to Atmospheric Research Facilities

Euroopan unioni
Euroopan aluekehitysrahasto

UIA URBAN INNOVATIVE ACTIONS

Teknologiateollisuuden 100-vuotissäätiö

J&AE
JANE JA AATOS ERKON SÄÄTIÖ

Support from University of Helsinki, Research Council of Finland, European Commission, Regional Council of Lapland, Helsinki-Uusimaa Regional Council, Technology industries of Finland Centennial Foundation, Jane and Aatos Erkko foundation and Business Finland are gratefully acknowledged.

Opinion: Insights into updating Ambient Air Quality Directive 2008/50/EC

Joel Kuula[1], Hilkka Timonen[1], Jarkko V. Niemi[2], Hanna E. Manninen[2], Topi Rönkkö[3], Tareq Hussein[4,5], Pak Lun Fung[4], Sasu Tarkoma[6], Mikko Laakso[7], Erkka Saukko[8], Aino Ovaska[4], Markku Kulmala[4], Ari Karppinen[1], Lasse Johansson[1], and Tuukka Petäjä[4]

New AQ parameters being considered: Aerosol number concentration, aerosol size distribution, Black Carbon content, Lung-deposited surface area (LDSA), oxidative potential

Key points:

1) Hierarchical observation system incl supersites, standard air quality sites and indicative measurements
2) Expert analysis for optimal measurement locations
3) New parameters, incl aerosol number concentration, size distribution, black carbon