

(1) Project title:

**Pan-Eurasian EXperiment – Finnish-Russian Earth System Research Network
(PEEX-FRESReN)**



(2) Partners (High Education Institutions, HEIs)

- University of Helsinki (UHEL)
- University of Eastern Finland (UEF)
- Tampere University Technology (TAU)
- Russian State Hydrometeorological University (RSHU)
- Saint Petersburg State University (SPBU)
- Moscow State University (MSU)

(3) Description of the PEEX-FRESReN project

(3.1) Summary of the project

The PEEX-FRESReN networking project contributes to a framework upscale the prestige of the Finnish academic educational system and distributing this know-how internationally. The involved Finnish university partners (as High Education Institutions, HEIs) have world leading research expertise especially in understanding the land-atmosphere interactions and role of atmospheric aerosols in this context, and are actively developing e-learning courses (Climate University), methods and approaches to student's education. All project partners are Universities (Univs) or/and research organizations working in the field of Earth's and environmental sciences. The PEEX-FRESReN aims are: 1) To carry out joint education activities through students'/teachers' mobility between HEIs partners; 2) To share knowledge and experience on state-of-the-art research activities and educational assets like e-learning between the project partners; 3) To open new opportunities for research collaboration in atmospheric and Earth system sciences. The proposed activities are: 1) joint elaboration of top level research-educational initiatives/ projects based on PEEX Science Plan (www.atm.helsinki.fi/peex/images/PEEX_Science_Plan.pdf) for student's realizations; 2) series of online webinars/ workshops; 3) practical students'/ teachers' short-term mobility/ visits between involved HEIs; 4) face-to-face educational research training course. The specific objectives for students' mobility between Univs will be linked with realization by students of developed research and educational projects (at MSc&PhD levels) on topics like: energy fluxes in forest canopy modelling; observations and modeling of surface-water ecosystems in boreal areas; fluxes of chemical substances by river flow in changing environment; aerosol effects on regional (Nordic, North-West Russia) and urban (Helsinki, St.Petersburg, Moscow) scales; pollution effects from continuous emissions on population and environment of Nordic countries and Russia; observations for aerosol particles and gaseous composition, and many more to be developed student projects. The specific objectives towards FI teachers mobility to RU Univs will be linked with realization a series of short-term visits for co-supervising students on research projects and lecturing for topics (described in details in PEEX Science Plan). The specific objectives towards RU teachers mobility to FI Univs will be linked with realization a series of short-term visits for co-supervising students on research projects and lecturing. Expected results are: 1) knowledge transfer of novel Finnish academic education concept and increased use of the modern e-learning methods (MOOC, Climate University), 2) research and educational collaboration between project partners, 3) new networking opportunities of high education collaboration in a field of Earth's sciences and climate change research, 4) integration of Univ students into joint FI-RU research activities.

(3.2) Needs analysis and roles of partners

3.2.1. Explain how the project intends to respond to an educational need with wider implications for cooperation between the countries and what is the added value of the planned cooperation activities compared to already existing cooperation.

Climate change causes an increase in frequency of extreme weather phenomena, while growing capital intensity of infrastructure leads to greater weather-related losses. The involved HEIs partners have had earlier bilateral collaboration, but this new PEEEX-FRESReN project would bring up a new collaboration framework. The need to study meteorological risks to adapt to climate change calls for new professional competencies. Leading-edge research of the project partners' research in environmental sciences will allow students to gain new relevant competencies in the international academic environment. In practice, the project will help to push the cooperation from the level of teachers to the level of students through the student mobility and online/face-to-face common educational activities. For example, the integration and comparison possibilities of atmospheric and environmental models and observations and approaches elaborated by FI-RU Univs will be analyzed. The new knowledge from lecturing and obtained skills during planned short-term visits by FI-RU students will be the most valuable to the participants. Establishing of personal networks among participants (especially due to joint work on student's projects) will be added value for the students' career development. Compared to the precedent cooperation, the added value of mobility is also linked to both state-of-the-art modelling systems, like the EC-Earth and Enviro-HIRLAM, installed and used at CSC (Center for Science Computing, Finland) and observational capacities of modern research infrastructures. These will be demonstrated to RU partners during visits to Finland and at intensive course on multi-scales and -processes modelling and observations. The students will learn about the advanced capabilities of observations and modelling for environmental applications. It is expected that output of such modelling and observations will be also used in new, selected student's research projects. The added value of mobility is also linked to state-of-the-art Station Measuring Ecosystem Atmospheric Relations (SMEAR-II & III) (hosted by UH) and Kuopio-Puijo SMEAR-IV (hosted by UEF) flagship stations in Finland (www.atm.helsinki.fi/SMEAR; which is also a part of the PEEEX-Observational-Platform) and to the urban measurements (by TAU). At these stations, continuous measurements for the ecosystem-atmosphere relations and urban environments are carried out. These measurements are connected with biosphere - aerosol - cloud - climate interactions and to the air quality. These will be demonstrated to the Russian partners during visits to Finland and intensive course and webinars/ workshops planned. It is also expected that time-series of such observations will be used in students' research projects.

3.2.2. Describe the relevance of the planned activities for the cooperation plans of the higher education institutions involved as well as the institutional commitment of the institutions to the network activities.

PEEX-FRESReN FI partners as HEIs are working towards student education and research collaboration with three Russian HEIs. The project supports the young scientists to expand their world views and to have experience working with the colleagues having different scientific backgrounds. Furthermore, employment market are in need for new generation of scientists with international, multi-cultural -language skills and, most importantly, the multi-disciplinary knowledge. In this project it implemented by teaching and introducing the research activities of each partner, and, at the same time learning from different education and working culture. The proposed project builds on already existing collaboration by Pan-Eurasian Experiment (PEEX) program, lead by UH, having an research collaboration network with over 30 Russian universities or research organization. One of the core idea of the proposed project is to use PEEEX Science Plan as source for relevant research topics for the project education and for the future research collaboration. The project would be a continuation and upscaling the previous "PEEX Academic Challenges" project (2019-2020) also funded by Finnish National Agency for Education, which was carried out between UH and RSHU. All the Finnish HEIs of PEEEX-FRESReN are also the partners (e.g. Finnish Meteorological Institute) in the just started Finnish Flagship program of the Academy of Finland called Atmosphere and Climate Competence Center (ACCC) activities (2020-2024). ACCC provides a world class research framework for climate change and air quality studies. The proposed PEEEX-FRESReN HEIs is linked to the ACCC impact activities as "PEEX Program" and "Science Diplomacy" as named as the ACCC Impact tasks. The Russian partners are committed to the PEEEX-FRESReN as they have already having joint project with the Finnish partners. MSU is coordinating the Russian mega grant project on urban air quality and of which Academician Kulmala UH is acting a Principal Investigator. As a whole the new PEEEX-FRESReN network will help to improve and upscale the student's education, its quality and preparedness for the future jobs. It will also provide additional value to Univ curriculum, broad and strength research activities, generate additional knowledge, make more visible the Univ profile on international level, learn more on shortcomings and advantages of FI&RU Univ educational systems, build horizontal contacts among students and teachers for expanding international

collaboration in education and research. Through PEEEX-FRESReN involved FI&RU partners can get also other valuable benefits such as lead to new approaches in teaching, learning, researching, be aware on high momentum issues in education e.g. e-learning and research, better understand on how FI&RU university education system works in different cultural traditions. It will also help to strength the university partnerships.

3.2.3. Describe the responsibilities, roles and tasks of the higher education institutions involved and justify why the chosen partner composition is relevant for the project.

PEEX-FRESReN main tasks are: 1) elaborate top-level research initiatives (TLRI) for students' projects; 2) build Earth system research network between FI-RU HEIs (& expand by inviting new interested HEIs); 3) organize and carry out mobilities (short-term visits) between HEIs; 4) organize online webinars/ workshops on research and educational topics (based on agendas of PEEEX and each HEI); 5) organize face-to-face intensive training course on "Multi-Scales and -Processes Observations, Modelling and Assessment for Environmental Applications"; 6) disseminate project activities/results; 7) project management, quality assurance and control. All PEEEX-FRESReN HEIs are involved at some degree in all tasks, play important roles and take responsibilities.

The building of PEEEX-FRESReN network has been already started during preparation of proposal, and it will be further extended starting online kick-off-meeting (Jan 2022; by UHEL). Joint elaboration of TLRI (in addition to already proposed in PEEEX Science Plan, PEEEX-SP) for students' projects will be initiated by HEIs teachers with involvement of participating HEIs interested MSc/PhD students. Short-term mobilities for students (14)/ teachers (7) for each partner will be arranged between HEIs timely depending on developing TLRIs as students' projects (many already proposed in PEEEX-SP). For more efficient exchange and networking, such visits will be arranged in a way that several students will simultaneously visit host HEIs. Before/after such visits online meetings will be arranged by host HEI for info-exchange/ reporting (planning/sumup). Each HEI will control flow of visits to its Univ, make necessary arrangements, have regular meetings for students/teachers to discuss project flow. Webinars/workshops (every 2-3 months) will be arranged online (each HEIs will take its turn in organization) on research-educational topics of PEEEX-SP and HEIs. Training course (up to 6 days) on "Multi-Scales and -Processes Observations, Modelling and Assessment for Environmental Applications" will take place in Aug-Sep 2022 (St.Petersburg, RU). Local host/organizer is SPBU, other FI-RU partners will contribute with programme development (lectures, practice, etc.; following example of PEEEX-AC - www.atm.helsinki.fi/peex/index.php/academic-challenge & www.atm.helsinki.fi/peexold/index.php/education/16-courses/184-april-2020-peex-ac-research-training-intensive-course). All project materials (incl. announcements, summaries of visits, developed TLRI, lectures, webinars, workshops, intensive course, etc.) will be disseminated/published also through PEEEX web-portal www.atm.helsinki.fi/peex. UHEL will be responsible for management, assurance and control of the project progress, performance, efficient use of resources. Justification on why the chosen HEIs are members of PEEEX-FRESReN consortium is mentioned (e.g. long-term positive collaboration between HEIs in multiple educational/research initiatives/projects) in other sections.

(3.3) Quality of cooperation, activity design and implementation

3.3.1. Describe the activities applied and explain how they will be executed during the project period. How will the project funding be used to cover the costs of the planned activities?

PEEX-FRESReN educates students on environmental problems e.g. climate change and air quality through organization of short-term visits, online webinars/workshops, face-to-face intensive course. The network facilitates exchange of knowledge between students, professors, lecturers, researchers of the project partners. This may lead to joint MSc/PhD programmes; new research collaboration; exchange with best practices of teaching / research. Every 3 months, UH will organize Zoom online meetings with all partners on implementation of objectives and planned/on-going/realized visits, webinars/workshops, etc. as well as their outcomes. For each visit, a separate Zoom will be organized before/after travel to host Univ (to control status/progress). The public web-portal (in EN-RU) will serve as a platform for the progress and achievements of PEEEX-FRESReN and provides blog/twitter announcements, newsletters, summaries of realized visits between Univs, lecturing materials (slides&videos) from webinars/workshops and course. Co-supervising/ consulting of students from both FI-RU sides will be implemented. Possibilities of double MSc/PhD will be investigated and promoted. Self-education and broadening areas of expertise will be encouraged. The outreach activities (with science-popular approach) by Univs also towards colleges, high schools, and public will take place. All PEEEX-FRESReN partners contribute to organization of the course (in St.Petersburg, Russia, Aug-Sep 2022). To broader opportunities to join, students/teachers from other Univs will be also invited to attend webinars/workshops, and apply for course (own expenses covered). All teams will check project progress, quality control, as well as efficient use of project resources. A detailed quality assurance plan will be setup at Zoom kick-off-meeting (Jan 2022), and undergo regular updates. Specifications are adjusted and corrective action will be taken when necessary. The progress

in terms of achieved milestones (results of completed visits, webinars/workshops, course), reports and resources will be monitored. After each visit, online presentation will be held. Regular meetings between involved students/teachers will be also done at each Univs to discuss project flow and inform partners. Experience taken within mobilities will be used by students for their thesis work. Important issue will be collaborative joint educational and research activities between involved faculties/departments of FI-RU Univs (Meteorology & Hydrology (MSU); Institute of Continuous Education, Institute of Hydrology & Oceanography, Faculty of Meteorology (RSHU); Geography & Atmospheric Physics, Cartography & Geoinformatics (SPBU)). For that, online workshops with presentations/discussions will be organized during project lifetime. The funding will be used for short-term travels of students & teachers (14&7 persons for each Univ), salaries (4000 Eu per each Univ), and organizational costs for course.

3.3.2. Explain how the project will take into account quality issues and prepare for potential risks. How will the project activities be integrated into the normal operations of the participating HEIs?

All PEEEX-FRESReN HEIs have long-track record of providing education and training to international students from all over the world. Univs involved have also a long cooperation history in different student/teacher exchange programs and research/educational projects and they have contributed the implement of the PEEEX program. Previous FI-RU collaboration includes implementation of COMBAT-Meteo, QualiMet, MEGAPOLI (EU FP7), CRAICC-PEEX (Nordforsk), PEEEX-CRUCIAL (Nordforsk), ECOIMPACT, Arctic-boreal Hub –UArctic thematic network, etc. projects linked to development of competence-based approach to hydrometeorological education and training, research on aerosols, pollution, meteorology, forest fires, environment, ecological, etc. topics. These background allows now to strengthen the collaboration e.g. the development of e-learning and on-line specialized training tools for environmental education/ studies. FU HEIS offer access to the Stations Measuring Ecosystem Atmosphere Relations (SMEAR) stations in Helsinki, Kuopio and Hyytiälä and the RU HEIs offer access to their research infrastructures (RSHU atmospheric lidar, satellite data receiving station, Valaam and Daimische bases, MSU and SPBU meteorological observatory and air quality monitoring, etc.) and RSHU's World Meteorological Organization's Regional Training Center will contribute to activities and planned network will push Univs cooperation on higher levels. Successful experiences in Tempus, Erasmus, Campus-Europe, FI-RU Cross-Border, FIRST+, etc. projects and academic mobilities, organization international study programs (POMOR, CORELIS, HH, etc. in technology, management, sociology, atmospheric sciences, applied and computational physics, etc.) on Earth sciences are beneficial for the project. Based on successful realization of previous joint educational, research and networking projects PEEEX-FRESReN partners do not expect any potential risks as both approaches online and face-to-face will be applied. All HEIs will ensure equal opportunity to MSc/PhD students to apply and participate in mobility, based solely on their academic merits; provide all necessary information and support to potential outgoing students and staff (prior to travels - invitations for visas processing will be arranged in advance in order to make planning of activities more efficiently/smoothly); health and safety risks will be lowered by active involvement of online format. Planned PEEEX-FRESReN activities are easily integrated into normal operations of participating FI-RU HEIs, because international mobilities (including virtual), online webinars/ workshops and training courses are now (due to covid19) became a part of each HEI educational process. Moreover, these will became a part of RU Univs in programmes of RSHU's Applied Hydrometeorology, Atmospheric Processes Modelling; SPBU's Earth Sciences, Environmental Sciences; MSU's Earth Sciences, Arctic Climate Research.

3.3.3. If the project is applying for student mobility: describe what kind of support services there are available for mobile students and what are the measures for the recognition of studies.

PEEX-FRESReN network will follow a synergy between involved Univs daily activities and PEEEX Science Plan and Educational-Platform activities. The way of open and constant communication and best practices between partners will be maintained, allowing both vertical and horizontal exchange between Univs, students, professors, lecturers, researchers. To make realization of the mobility plans more efficient, all partners will be treated equally and UHEL, as leading organization, will ensure commitment, innovation and continuity.

Short-term visits/ mobility of students/teachers is important step towards internationalization strategy. For better integration and success, the International Offices at RU Univs and International Exchange Services at FI Univs will share and provide all useful and necessary information and links about travel arrangements, accommodation options, assist on these matters when necessary. Information on culture, traditions, language, etc. will be also provided. Wish of visitor to learn/participate in the hosting Univ student activities including for science, art, sport, etc. will be promoted. The continuous support will be provided for students in order to facilitate success at hosting institution, and especial attention to be paid on the first day of arrival. Visitors will be accompanied by a "buddy" (student at host Univ) to make communication process easier. HEIs will ensure equal academic treatment and services for home/incoming students

and integrate incoming students into everyday Univ life. English as language of international communication in students' education-research community will be used.

The communication procedures will be setup at start of the project. The involved persons contact information will be also provided for all participants. The leaders of FRESReN Univs teams will keep tracking of the project progress. Any delay or change will be immediately communicated. The following issues are considered as key for efficient flow: consideration of equality and collective responsibility of all participants; efficiency and transparency of overall management; ensuring compliance with all relevant regulations; realization of sound monitoring and professional administration to prevent time and cost escalation.

All Univs will accept all activities implemented in the project as counting towards students' degrees, provided these have been satisfactorily completed by students. The students' progress and success will be announced and awarded. In particular, active participation in a series of webinars/workshops (at least, 2 per each partner) will be awarded with an attendance certificate. For students, whom have successfully completed the training course, certificates (3 credits) will be also granted. Such course will include lecturing and students' small-scale research projects realization (with official oral presentation/ defence of the research carried out).

(3.4) Expected results and impact

3.4.1. Describe how the activities/results of the project will support the internationalization of the students and staff of the participating institutions also beyond those participating in the project.

Internationalization value of the PEEEX-FRESReN builds on new horizontal collaboration among the FI&RU Univs students and university teacher. The mobility will speed-up building professional contacts for students and with the local research networks relevant for future carrier and collaboration. This may open up new doors to international positions and jobs of the graduated students. The mobility supports students to get a state-of-the-art knowledge and experience in integrated approaches for atmospheric, climate, ecosystems, etc. processes understanding, measurements and modeling, global-regional climate changes, methodological approaches for meteorology-chemistry-aerosols-etc. measurements and modelling, atmosphere-land-ocean interactions and feedbacks. The students learn to know and to network with one of the leading scientists in these research areas. All FI university professors (Petäjä, Virtanen, DalMaso) have impressive records of international funding, positions and awards (see the short CVs attached). These will significantly increase the valuation of the students' FI&RU Univs curriculum and attract joint co-supervision for the new research projects. The mobility also enables on site visits at the partner institutes' research stations and provides hands-on experience on the measurements going on at the state-of-the-art flagship observation stations together with the data analysis e.g. modelling systems. The results obtained of these exercise will be used in students' research projects. All these contributions are valuable assets for university curriculum improvement from educational and research points of view. These will lead to more advanced levels and quality of classes/ disciplines with modern knowledge incorporated into lecture-practicum materials. Such updates are needed for practical step towards a better quality university educational system. Through this project, a new generation of talented students will emerge expanding community of young researchers. The partner universities will get more visibility and recognizability among FI - RU collaboration frameworks. The PEEEX program coordinated by UH provides a larger collaboration framework, after the mobility project, for the future research, education and training activities between project partners, but also between many other research organizations in Europe e.g. Nordic countries and in Russia. As PEEEX has long-term research and education agenda and is expanding community, more students will be interested to enroll into FI HEIs educational programs. For RU universities, not only involved into this project, it will expand existing collaboration to more advanced level of partnership, more students will be involved into international education-research activities, learning more about modern observational and modelling methodologies and tools, improving communication skills, building international research teams.

3.4.2. Describe how the project plans to communicate the activities and results of the project period.

PEEX-FRESReN dissemination, exploitation and its implementation plan will be developed by partners to ensure project's high visibility, accessibility and promotion, its results during/beyond project, thus maximizing added value of funded activities. Such plan to be a reference framework for evaluating impact of communication/ dissemination activities and will be updated as project progresses. To achieve the highest possible impact of its activities and best contribute to support and strengthen FI-RU collaboration, HEIs partners will focus on maximizing effectiveness and scope of its dissemination/communication activities. These specific activities both address general public and potential stakeholders to raise project awareness and its achievements. Plan will be structured according to dissemination objectives, time schedule, target groups, impacts and implementation measures and tools: networking community,

visual identity, documents for sharing, videos, publications in academic/professional journals, online channels, project website, open educational resources, contact databases, social media, webinars/ workshops/ training, etc.

PEEX-FRESReN communication channels were initially established at proposal preparation among main contacts of involved HEIs. Detailed procedures (including both vertical-horizontal ways of communication) will be established at project start. Main channels will include online (e.g. zoom) tools showed excellence in covid19 times, plus classical e-mail. At each HEIs level, partners will collect open lecture proposals, develop schedules and communicate to students via dean's offices, HEIs websites, social networks. UHEL will increase the project visibility through PEEX web-portal/Blog/NewsLetters (community >4000 members). Academic mobility department at each HEI will assist establishing contacts between students/teachers and arrange mobilities.

The visual "identity" of PEEX-FRESReN (e.g. logo, info-leaflet, poster, etc.) will be setup at project start, maintained during/beyond, and cross-linked with HEIs websites. E-NewsLetters (quarterly) will inform all staff and stakeholders about project activities/results. The presentation of PEEX-FRESReN for academic staff/students and relevant Univs administrations will be organized as part of planned webinars/workshops. The project results will be reported in peer-reviewed journals, at national/ international conferences. After the project, exploitation of results will be sustained in Univs. PEEX-FRESReN results will be disseminated not only at HEIs and continuously enlarging PEEX community, but also at national/international levels through the WMO Global Campus, National Acad. Assoc. of Univs in Hydrometeorology, International Assoc. of Meteorological Education and Sciences, RU Geographical Society, Academy of FI, others. FI HEIs will ensure the continuation of further PEEX-FRESReN networking expansion and collaboration with Russian partners via PEEX.

(4) Travel/mobility between the Finnish and Russian Universities

(4a) From Finland to Russia

Short-term student mobility

14 UHEL persons x 6 days + 14 UEF persons x 6 days + 14 TAU persons x 6 days
number of participants: 42 & number of days (total): 252

Staff mobility

7 UHEL persons x 4 days + 7 UEF persons x 4 days + 7 TAU persons x 4 days
number of participants: 21 & number of days (total): 84

(4b) From Russia to Finland

Short-term student mobility

14 RSHU persons x 6 days + 14 SPBU persons x 6 days + 14 MSU persons x 6 days
number of participants: 42 & number of days (total): 252

Staff mobility

7 RSHU persons x 6 days + 7 SPBU persons x 6 days + 7 MSU persons x 6 days
number of participants: 21 & number of days (total): 84