

CREMLIN PLUS

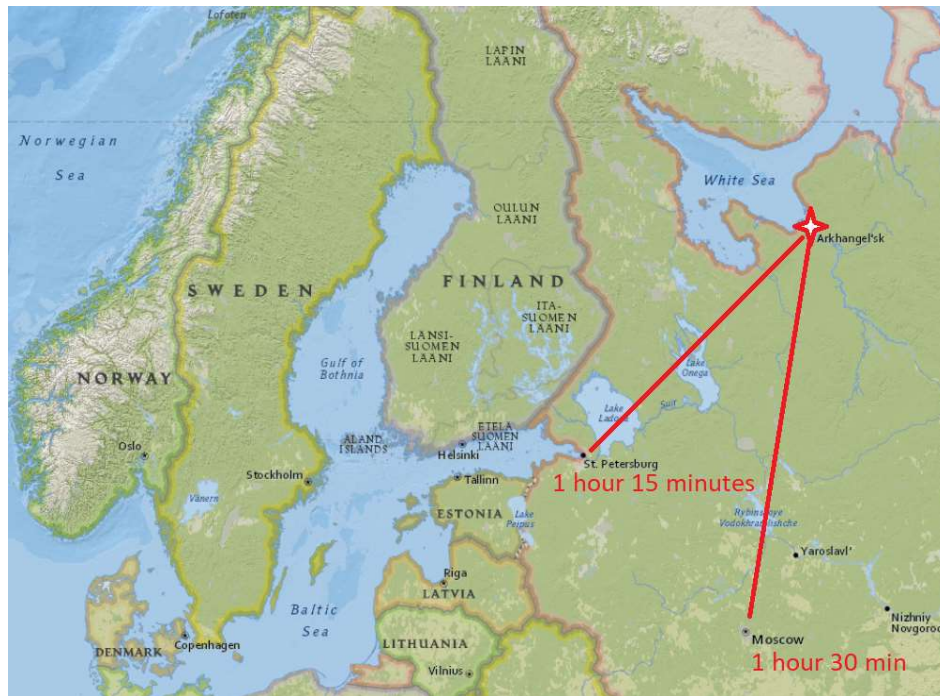
Connecting Russian and European Measures
for Large-scale Research Infrastructures



Core Facility Center “Arktika”

RESEARCH DIVISION OF THE
LOMONOSOV NORTHERN
(ARCTIC) FEDERAL
UNIVERSITY

+ 1. Location of the facility (indicating the place on the map of the Russian Federation)



Arkhangelsk region, Arkhangelsk, Northern (Arctic) Federal University



+ 2. Facility uniqueness: the scope

The CFC “Arktika” is a unique object of research infrastructure in the field of modern analytical chemistry capable to meet the most difficult challenges in analysis of extremely complex objects:

- Ultra-sensitive quantification of target compounds in environmental objects, biological tissues and fluids, raw materials, technological media etc.;
- Identification of unknown compounds and revealing their structure;
- Untargeted screening (known unknown and unknown unknown) of compounds of various classes in complex matrices;
- Development of novel analytical methods for screening, identification and quantification.
- Development of novel methods for extraction and separation of compounds from complex matrices



3. Facility uniqueness: methods

The most important feature of the Center is a combination “under one roof” of a number of analytical techniques covering all directions of modern instrumental chemical analysis

Elemental analysis:

- Atomic absorption and emission spectroscopy;
- X-ray fluorescence spectroscopy (energy dispersive, wavelength dispersive, total reflection)
- Inductively coupled plasma spectrometry (optical and mass spectrometry detection)
- Light element analysis (CHNSO) and sum parameters (TOC, TN, AOX etc.) determination

Organic analysis:

- High-performance liquid chromatography and gas chromatography;
- Mass spectrometry, tandem mass spectrometry, high-resolution and ultrahigh-resolution mass spectrometry, matrix-assisted laser desorption-ionization (MALDI) mass spectrometry;
- Pyrolysis gas chromatography – mass spectrometry

Extraction and concentration:

- Supercritical fluid extraction;
- Pressurized liquid extraction

Structural analysis:

- X-ray diffractometry;
- High-resolution NMR spectroscopy
- FTIR and Raman spectroscopy
- Optical fluorescence spectroscopy

Organic analysis:

- High-performance liquid chromatography and gas chromatography;
- Mass spectrometry, tandem mass spectrometry, high-resolution and ultrahigh-resolution mass spectrometry, matrix-assisted laser desorption-ionization (MALDI) mass spectrometry

Materials characterization:

- Scanning electron microscopy;
- Atomic force microscopy;
- Differential scanning calorimetry;
- Isothermal calorimetry;
- Synchronous thermal analysis
- Antioxidant activity measurement
- Analytical ultracentrifugation

4. Facility uniqueness: instrumentation

The Center has more than 70 research instruments (complexes), some of them are unique:

- Two-dimensional gas-chromatography – high resolution mass spectrometry system **Pegasus 4D GC-HRT** (Leco, USA)
- “Tribrid” ultrahigh-resolution mass spectrometer **Orbitrap ID-X** (Thermo scientific, USA)
- NMR Spectrometer **Avance III 600** (Bruker, Germany)
- Quadrupole ion trap – time-of-flight MALDI mass spectrometer **Axima Resonance** (Kratos, UK)
- Supercritical Fluid Chromatography – tandem mass spectrometry system based on **3200 QTRAP**(ABSciex, Canada) MS and **ACQUITY UPC2** HPLC (Dionex, USA)
- Field asymmetric waveform ion mobility spectrometry – high resolution tandem mass spectrometry system **SelexIon-TripleTOF 5600+** (AB Sciex, Canada).

5. Facility uniqueness: staff and own research

Our staff includes 30 qualified employees – researchers and engineers performing work for partners and customers, as well as own research mainly in the fields of environmental analytical chemistry and chemistry of natural compounds

Latest publications of the staff in top journals:

- Migration and transformation of 1,1-dimethylhydrazine in peat bog soil of rocket stage fall site in Russian North. *Science of the Total Environment*. 2020. 726, 138483
- Evaluation of temperature and pressure effects on retention in supercritical fluid chromatography on polar stationary phases. *Journal of Chromatography A*. 2020. 1610, 460600
- Rapid simultaneous determination of pentacyclic triterpenoids by mixed-mode liquid chromatography–tandem mass spectrometry. *Journal of Chromatography A*. 2020. 1609,460458
- Identification of novel disinfection byproducts in pool water: Chlorination of the algaecide benzalkonium chloride. *Chemosphere*. 2020. 239, 124801
- Arctic Snow Pollution: A GC-HRMS Case Study of Franz Joseph Land Archipelago. *Environmental Pollution*. 2020. 1064 (in press)
- Identification of avobenzone by-products formed by various disinfectants in different types of swimming pool waters. *Environment International*. 2020. 137, 105495
- Structural characterization of the lignin from Saxifraga (Saxifraga oppositifolia L.) stems. *International Journal of Biological Macromolecules*. 2020. 155, 656-665
- Structural characteristics of different softwood lignins according to 1D and 2D NMR spectroscopy. *Journal of Wood Chemistry and Technology*. 2020. 40(3), 178-189
- Exosomes in the phloem and xylem of woody plants. *Planta*. 2020. 251(1), 12
- Biocatalysis of industrial kraft pulps: Similarities and differences between hardwood and softwood pulps in hydrolysis by enzyme complex of penicillium verruculosum. *Catalysts*. 2020. 10(5),536
- Characterization of Ionic Liquid Lignins Isolated from Spruce Wood with 1-Butyl-3-methylimidazolium Acetate and Methyl Sulfate and Their Binary Mixtures with DMSO. *Molecules*. 2020, 25(11), 2479

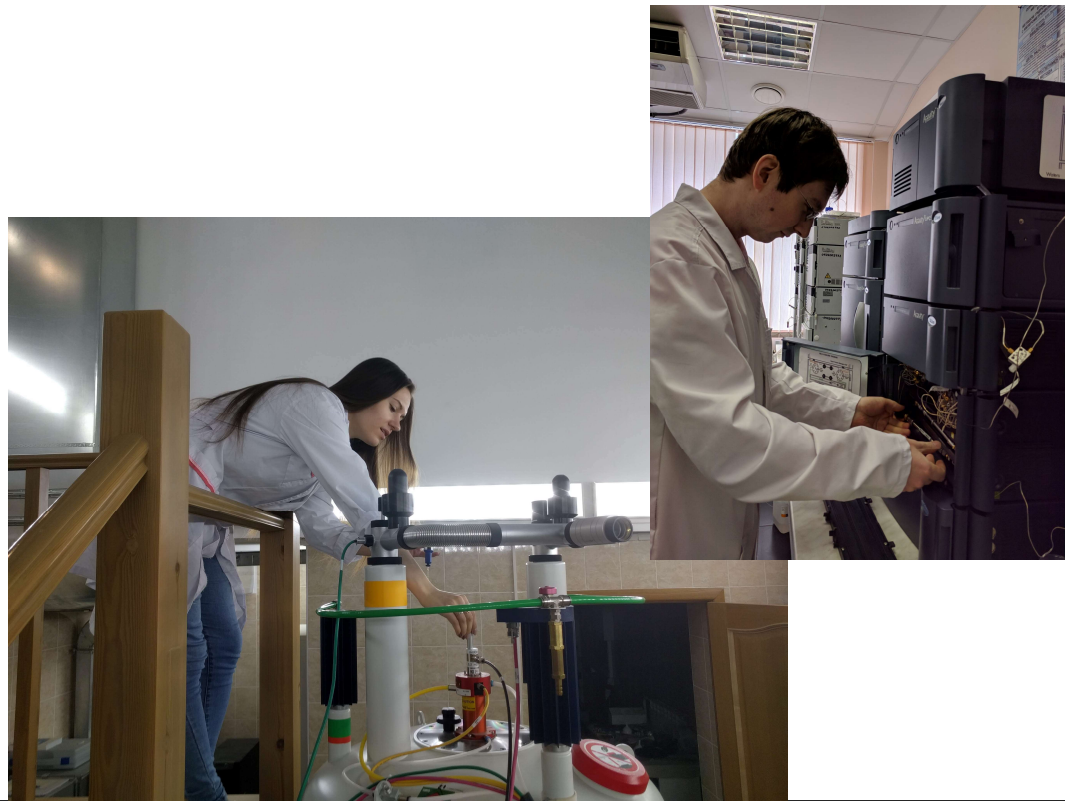
+ 6.Existing types of access to the facility

Access to the equipment of the CFC “Arktika” is provided in accordance with the Regulations established by Ministry of Science and Higher Education and NArFU.

The following types of access are possible:

Direct access: carrying out experiments directly by customer or together with the Center staff.

Remote access: discussion with the customer and the completion of work by the CFC stuff.



+ 7. Procedures and internal access policies for external users (including foreign users), availability of special type visa (for scientists, etc.)

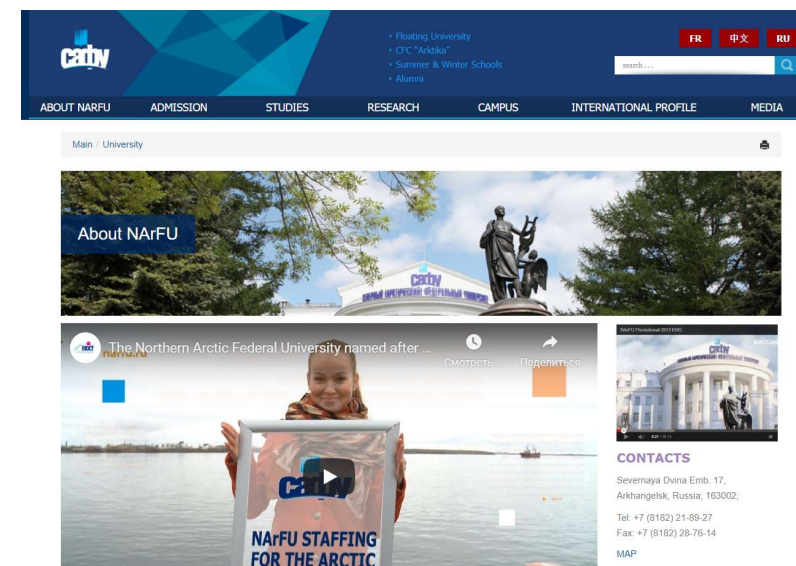
1. Access is provided after the signing of the relevant Contract (Agreement) for the completion of works, with the description of technical details.
2. Visa support is provided by NARFU special services

Для внешних пользователей

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Заказчик*	Укажите название организации <input type="text"/>
Реквизиты для договора*	<input type="text"/>
Контактная информация*	Укажите контактное лицо, телефон, e-mail <input type="text"/>
Содержание заявки*	<input type="text"/> Выберите файл Файл не выбран

- О центре
- Услуги
- Лаборатории
- Метрологическое обеспечение
- Научная деятельность
- Публикации
- Сотрудничество
- Образовательная деятельность ЦКП
- Стипендии Аналит – Shimadzu
- Поддержка Минобрнауки
- Контакты
- Сотрудники
- Документы



+ 8. Main users of the facility

The main users of the structure: the research staff of the NArFU, external users of both scientific organizations and industrial companies. A large number (more than 30) of external users and partners in all Federal Districts of Russia. CFC **provides** a wide range of unique high-tech services **forming** the point of cooperation between higher education and academic science, **plays a key role** in satisfying needs for research for greatest companies in the country:

- Pulp and paper mills, oil and gas production companies, chemical synthesis companies, pharmaceutical companies.
- Northern Shipping Company, **Severalmaz**, companies of Severodvinsk nuclear shipbuilding Center.



ЗАО «Кемира Хим»



+ 9. Cooperation with the foreign partners

A tight International collaboration of the CFC “Arktika” in the context of common projects and agreements on cooperation is established with the following partners:

- Al-Farabi Kazakh National University (Alma-Ata, Kazakhstan);
- University of Ljubljana (Slovenia);
- Nicolaus Copernicus University (Torun, Poland, Professor Boguslaw Buszewski).

European Association of Chemistry and the Environment (ACE).

A collaborative School of Young Scientists for European listeners is planned to be held at the CFC “Arktika”.



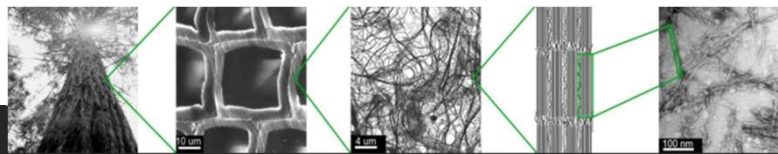
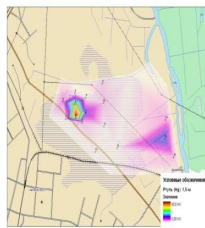
ASSOCIATION OF
CHEMISTRY AND THE
ENVIRONMENT

"Ecology of Biosphere"
Laboratory



+ 10. Brief analyses of the facility (strengths, prospects for international development)


- A significant part of the Center's instrument park is represented by **unique research complexes** available in Russia in a single copy.
- The CFC has its **own staff of specialists** (30 people, including 1 doctor of chemical sciences, 13 PhD).
- The high level of research carried out by the staff of the CFC, including cooperation with external users, is confirmed by the **presence of prestigious grants and contracts** for research work, the total annual volume of which exceeds 50 million rubles.
- The most important evidence of the scientific level of the CFC is the growing number of publications in prestigious world scientific journals. More than **100 articles** in the journals indexed in the **Web of Science database** were published in 2015-2020 with the participation of the Center's staff.



+ 11. Facility website

https://narfu.ru/en/research/cfc_arktika/

Publications



Year

Show 100 entries

Search:

Type some text here for quick search...

Clear filter

for example, Solvatochromic polarity parameters for binary mixtures of 1-butyl-3-methylimidazolium acetate with water, methanol, and dimethylsulfoxide

Article


Year

Assessment of Fe, Cr and Pb concentration changes depending on the age of peat core layers

2019

IOP Conference Series: Earth and Environmental Science. 2019. V. 263.

DOI: 10.1088/1755-1315/263/1/012052




АРКТИКА
ЦЕНТР КОЛЛЕКТИВНОГО ПОЛЬЗОВАНИЯ
НАУЧНЫМ ОБОРУДОВАНИЕМ

Publications

Modern analytical methods in
Ecology


Main / Research / Core Facility Center "Arktika"

Core Facility Center "Arktika"



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The main goals and objectives of Core facility center "Arktika"

The formation of the innovative environment, the development of research activities

— [Laboratories](#)

Improving the training quality of specialists at all levels

ARCTIC FLOATING UNIVERSITY

A unique scientific and educational marine expedition on board the research vessel “Professor Molchanov”



- ✓ 12 expeditions to the Arctic Ocean since 2012
- ✓ 35 HEIs and research organizations took part
- ✓ International since 2013

Multidisciplinary research of water and coastal areas in the western part of Russian Arctic; practical training of students and young researchers for work in the region

Since 2012: 600+ participants including 260 students and PhD students from 17 countries



RESEARCH VESSEL "PROFESSOR MOLCHANOV"

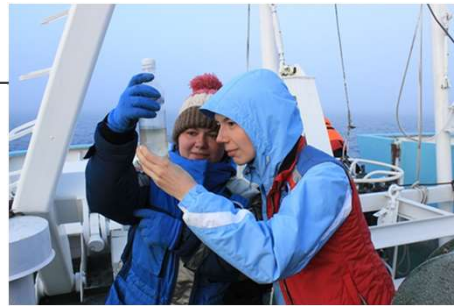
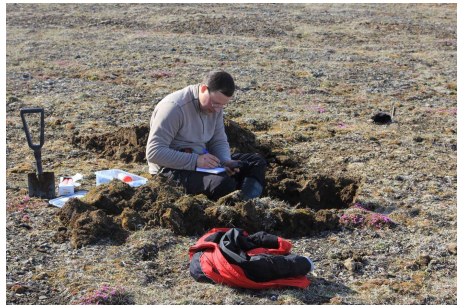


- ✓ carrying up to 60 passengers;
- ✓ ice-strengthened vessel, ice class - Arc 5;
- ✓ non-restricted sailing area;
- ✓ no limitations on weather conditions;
- ✓ wet and dry laboratories;
- ✓ 2 wardrooms and a room for lectures and reunions.

- ✓ SBE 32 equipped with 12 bathometers with capacity of 5 liters, and CTD Probe;
- ✓ Bottom sampler;
- ✓ Automatic weather station AWS-2700.

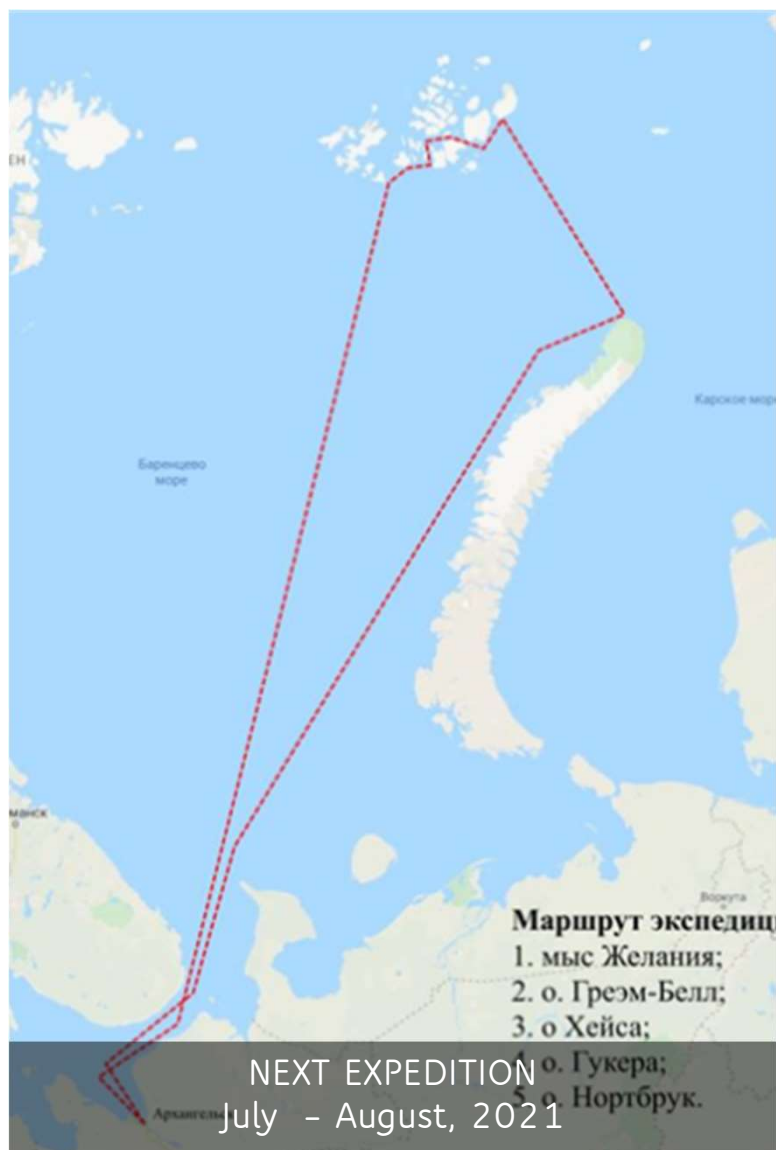


OPPORTUNITIES FOR MARINE AND TERRESTRIAL RESEARCH



- ✓ Study of the hydrological regime of the seas of the Arctic Ocean;
- ✓ Environmental monitoring in the marine and coastal zones of the White, Barents and Kara Seas;
- ✓ Study of biodiversity of the Arctic region;
- ✓ Geological research (terrestrial);
- ✓ Other research fields can be included





More information:

<https://narfu.ru/en/research/expeditions/fu/>

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