

## **TRAINING COURSE FOR PHD STUDENTS 'MANAGEMENT OF CLIMATE DATABASES'**

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In the context of climate change, effective management of climate data is a crucial task for scientific research, forecasting, and decision-making in ecology, meteorology, and environmental management. PhD students conducting research in climatology, ecology, and related fields require a deep understanding of methods for collecting, processing, analyzing, and storing large volumes of climate data. This course is relevant because it:

- provides knowledge of modern approaches to creating, administering, and optimizing climate databases;
- introduces international standards for climate data storage and working with global climate repositories;
- teaches methods for data analysis, anomaly detection, and reconstruction of missing records;
- develops practical skills in using software tools for managing large climate datasets.

Thus, the course "**Management of Climate Databases**" prepares PhD students for scientific and practical work in the face of modern challenges related to climate change and the digital transformation of science.

The course aims to provide PhD students with the theoretical knowledge and practical skills necessary for the effective collection, storage, processing and analysis of climate data. The course is aimed at mastering modern methods of managing large volumes of climate information, using specialized software, adhering to international standards for data storage and ensuring their reliability.

The target audience for this course is PhD students in natural sciences (103 Earth Sciences, 101 Ecology, 193 Geodesy and Land Management, etc).

The postgraduate course "Climate Database Management" (DM) will have a common basis with the master's course "Data and Information for Climate Services" (DICS), but will differ in depth, emphasis and learning objectives.

The DICS course is focused on practical skills in working with climate databases, familiarization with the basic principles of their organization, processing and analysis, with an emphasis on the use of ready-made software solutions. The DM course is characterized by an in-depth study of the theoretical and methodological foundations of climate database management, consideration

of complex algorithms for data analysis and recovery, and research into new approaches to managing large data sets.

**Competencies.** C1. Assessment of the impact of climate change and variability and climate extremes on different spheres (society, environment, economy, etc.) at different scales, taking into account the full range of interconnections between the links of the climate system and transdisciplinary interactions with society

***Learning Outcomes (LO) and Performance Criteria (PC):***

**LO1.** Explain the process of creating and managing climate datasets, including the consistent application of data recovery, quality control, homogenization, and integration into a climate dataset management system.

**PC1.** Apply quality control processes to climate data and derived time series.

**LO2.** Describe geographic features and historical events that affect the climate observing network, including political events and changes in observing methods and techniques

**PC2.** Evaluate the location and characteristics of observation sites in accordance with the requirements of a climate observing reference network

**LO3.** Demonstrate skills in using a variety of software tools required for climate data management, including office suites, statistical software, GIS, and specialized packages for quality control and homogenization of data.

**PC3.** Perform procedures for preserving and restoring climate data.

**LO4.** Design a climate data base and metadata using a climate data management system, including raw, quality-checked, and homogenized data.

**PC4.** Collect and store climate data and metadata in appropriate databases

**LO5.** Create, document, and analyze climate data for specific purposes, including metadata, and explain their applications and associated uncertainties.

**PC5.** Create, archive, and document climate data sets.

Online courses are more appropriate for working with graduate students, because graduate students often combine studies with scientific research, teaching or work on projects. The online format allows you to independently adjust the study schedule and combine it with other responsibilities.

Using the online format makes it possible to work with international climate databases, digital libraries, open scientific platforms and modern software regardless of your location.

The use of virtual laboratories, simulations, automated data analysis algorithms and machine learning tools allows PhD students to practice their skills in a real environment.

Thus, the online course "Climate Database Management" not only meets the needs of postgraduate students, but also opens up more opportunities for them for effective learning, research and international cooperation.