Proposed thesis topic for the Doctoral degree studies (2021-2025) in Ecology and Environmental Science at Marine Research Institute (Klaipėda University)

Title	**The role of meso- and submesoscale dynamics in the Arctic Ocean's environment from multi-mission satellite observations**
Brief description of the topic	Arctic Ocean is a host to some major ocean circulation systems many of which are associated with intense meso- and submesoscale dynamic processes like eddies and fronts of various scales and internal waves that can transport water masses and corresponding tracers over long distances from their formation sites. However, comprehensive observations of their characteristics are currently not available and are limited to spatially and temporally sparse in situ observations. This study should analyse spatial and dynamic properties of eddies, fronts and internal waves and their role in lateral and vertical transport of heat, sea ice and nutrients over selected key regions of the Arctic Ocean (Fram Strait, coastal areas around Svalbard, etc.) using multi-mission high-resolution satellite observations. The key aspect of the study would be a synergistic use of weather-independent synthetic aperture radar (SAR) measurements made by Sentinel-1A/B and ALOS-2 PALSAR-2 in conjunction with optical observations from Landsat-8 and Sentinel-2, -3 to tackle both physical and biological aspects of these processes. The above synergy would allow to effectively observe surface signatures of various meso- and submesoscale processes and their variability, and quantify associated changes in sea surface temperature, sea ice and chlorophyll concentrations, thus providing a better understanding on their role in the ongoing changes of the Arctic Ocean's hydrology and climate.
Requirements for a candidate	Applicant should have a fundamental knowledge in marine hydrology/physical oceanography or geoinformatics, and basic knowledge in marine ecology. Basic experience in using GIS and statistical methods in analysis of oceanographic and/or Earth Observation (EO) data, as well as willingness to work with contemporary satellite observations acquired from different EO missions, and conventional oceanographic measurements (vertical profiles of temperature, salinity, etc.). Good English language skills are necessary. Experience of a candidate in studies of marine environmental processes using EO data will be given a preference during evaluation.
Existing research experience	PhD student will work in a team of remote sensing specialists with experience in environmental remote sensing and analysis of multi-scale upper ocean dynamic processess using data from various satellite sensors and field observations. The PhD student will be supported by the expertise in remote sensing for identification of eddies in satellite measurements made in visible-infrared-microwave bands. These techniques were effectively used before for analysis of eddies, frontal zones and internal waves in different Arctic regions, as well as in the Baltic Sea. Local team will also support with the background knowledge in the Arctic Ocean's hydrography, satellite oceanography, processing and analysis of contemporary satellite observations and oceanographic data.
Existing research infrastructure and support	This work will be performed to enhance the Arctic Ocean's research at Marine Research Institute. The study will use a novel approach for synergistic use of multi-sensor satellite data in conjunction with field oceanographic data and high-resolution model outputs available from partner institutions in USA (University of Washington). Germany (Alfred Wegener Institute) and Norway (University of Bergen, Norwegian Polar Institute). Most of satellite data to be used in the study are publicly available (Sentinel missions, Landsat-8), while ALOS-2 PALSAR-2 data are available for supervisor within ongoing project with Japan Aerospace Exploration Agency. Main tools for satellite data pre-processing and analysis will be also provided.
Supervisor	Dr. Igor Kozlov (igor.eko@gmail.com)
Advisor	Dr. Diana Vaičiūtė