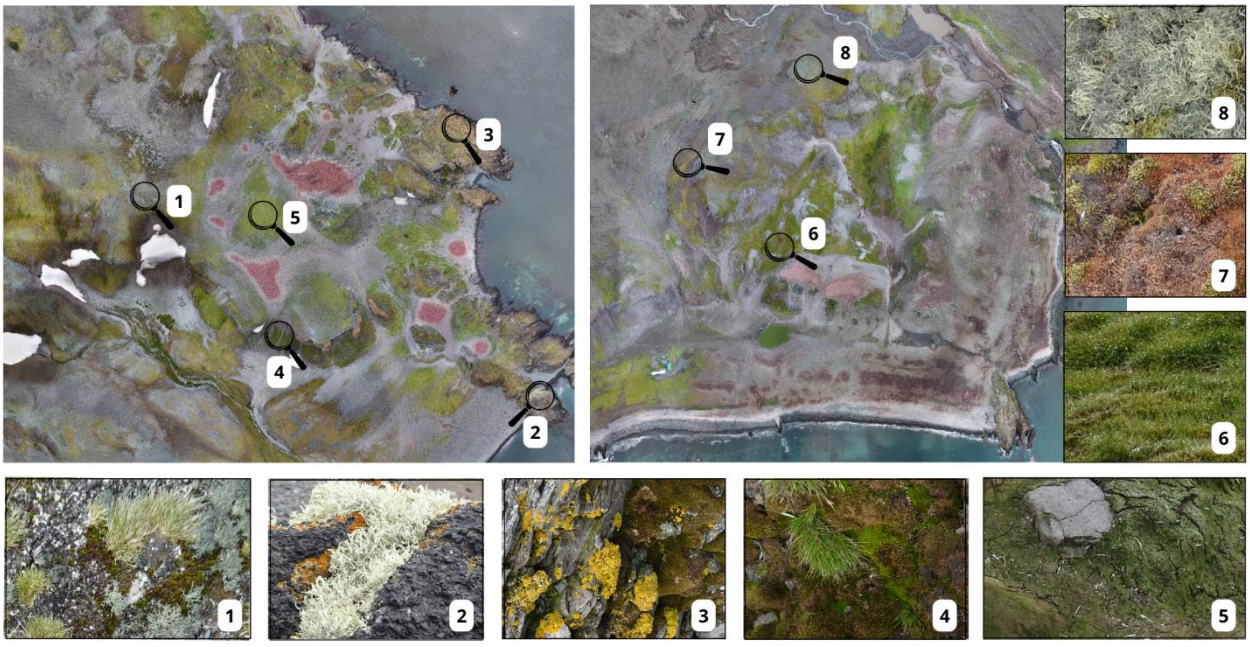
Unmanned Aerial Vehicles (UAV) and satellites synergy for monitoring of Antarctic lichen communities (USNEA)

Climate change, which until recently was debated, is at a stage of development of scientific knowledge. In the Southern Ocean region, which stretches from the coast of Antarctica to 60°S, climate change is particularly noticeable due to phenomena such as the changing extent of sea ice and the retreat of glaciers, which open new areas of land for selected groups of organisms. In this extremely hostile and inaccessible place, a certain group of organisms that are adapted to the climatic conditions of Antarctica, inhabited the newly deglaciated areas. These organisms are lichens. This project aims to determine the abundance of lichens species and their conditions at South Shetland Archipelago. Using the available satellite images from the last fifteen years, we can conduct a research programme equal to several scientific expeditions simultaneously, which by the classical approach, would take many years and require countless financial and human resources. Therefore, as part of this project, we would like to propose an innovative solution for validating satellite images of lichen habitats in Antarctica based on multispectral UAV images and in-situ hyperspectral imaging (HIS) and spectroradiometry measurements. We address the following hypotheses: that the existing algorithms and indexes to identify lichens and other types of typical vegetation based on satellite and UAV multispectral images in Antarctica are by no means universal, and it is important to complement them with new theoretical considerations and field experimental observations. The set of obtained images will be split into training and test datasets (based on location, phenological period, cloud cover and snow cover) and used to develop a new deep learning algorithm for detecting and identifying lichens. The methodology developed from this research case may become an alternative for field studies on other types of vegetation in inaccessible areas. We selected four testing areas (Rakusa Point, Llano Point, Uchatka Point, and Patelnia Point) with easily recognizable different types of vegetation at Antarctic Specially Protected Area 128, as presented in the figure below, where the field works will be conducted during two summer seasons.



Localization of testing areas at ASPA 128 with easily recognizable different types of vegetation. Rakusa Point (left) and Llano Point (right)