Sinkholes, as macroscopic discontinuous deformations of the ground surface, are observed all over the world. Global warming is inducing new phenomena in the natural environment. The rapid thawing of the arctic permafrost triggers landslides and **massive sinkholes**. These phenomena not only cause severe changes in the environment but are primarily related to the increasing amount of **CO_2 and methane emissions**. In turn, the climate changing indicates an intensification of the drought, which could be accompanied by the **hazard of the sinkhole** and the associated risks. **Human-caused sinkholes** are observed in countries like Great Britain, the USA, China, or RPA. Not without significance is also the social dimension of the presented problems, difficulties in everyday functioning, and material losses.

Monitoring of both natural or anthropogenic sinkholes is difficult and requires specialized measurement works. Many times they are time-consuming and costly. From the point of view of human safety, the information about the activation of the deformation process and the moment of the forming sinkhole occurrence is the most important. Nevertheless, from a global perspective, the mechanism of sinkhole occurrence in Arctic regions is one of the key issues necessary to better understand the role of the impact of CO_2 emission from massive sinkholes in this area on global warming. Moreover, in many sinkhole-prone regions, population growth forces communities to settle down in areas characterized by a substantial risk of sinkhole occurrence. This problem also applies to areas of old mining, where decommissioned shafts or mine operations are likely to cause the occurrence of a sinkhole. Obtaining it in good time would allow for evacuation from endangered areas or securing the surface infrastructure. Monitoring the movements of the terrain surface before the occurrence of the phenomenon is a challenge for classical observation techniques such as leveling, GPS, tachymetry. Remote techniques such as **Satellite Radar Interferometry (InSAR)** can be an effective tool to solve this issue. It allows the observation of movements at the level of a single mm. The increased interest in InSAR technology in the detection of movements caused by sinkholes is due to the increasingly easier availability of images with a satisfactory spatial resolution of the information obtained.

The sinkholes may also be accompanied by other factors that can be observed by satellite techniques such as changes in temperature distribution in the subsurface layers, vegetation or moisture in the soil layers. These features can be observed with the use of radar and multispectral sensors. In combination with the results of observations, InSAR can bring additional knowledge about the mechanism of forming sinkhole. A sinkhole risk assessment is possible using **Machine Learning** tools. They make it possible to search for patterns in data that are difficult or even impossible to describe with a strict mathematical model. The project assumes that **advanced satellite data processing combined with Machine Learning tools will allow to better understanding of sinkholes formation mechanism and the effective detection of precursor of deformation process**.

The study will provide a more complete pattern for the forming sinkholes and will contribute to a better understanding of the mechanisms involved. The developed methodology could be used for research into Arctic CO_2 emissions from massive sinkholes, hazards, and risk management due to droughts and human-caused sinkholes. Identification of forming sinkhole precursors also will be an element of an intelligent early warning system.