Transition from the Neogene to Quaternary (about 2.588 million years ago) is characterized by palaeoceanographic and palaeoclimatic changes leading to intensification of Northern Hemisphere glaciation and emergence of glacial-interglacial cycles connected to orbital forcing (Milankovitch cycles). In result, extensive environmental changes occurred, including climatic shifts that played a significant role in the global transformation of the Earth system. Unfortunately, the stratigraphical position of the Neogene/Quaternary boundary has not been properly establish yet. Without this, detailed palaeoenvironmental studies are impossible. During fieldwork conducted in 2022, polish team applied an improved excavation methodology to collect fresh rock blocks from the Monte San Nicola section. This was a unique research initiative allowing to obtain an exceptional rock material formed in the deep sea zone (mudstones and claystones) containing the 20-cm so-called ‘Nicola’ bed deposited in the conditions of global cooling. Thanks to this preliminary step, ultra-high-resolution integrated geological investigations can be performed. In the following project we will focus on: 1) Analysis of changes in oxygenation level at the bottom of the basin related to changes in paleocirculation driven by global environmental shifts (trace fossils). 2) Study of changes in surface circulation based on the variability of marine algae remnants called dinoflagellate cysts (palynology). 3) Study of shifts in the direction of the winds that in the past transported the red sands of the Sahara to the sea that covered the present-day mainland of Sicily (mineralogy); 4) Estimation of the conditions and rate of sedimentation of the sapropel layer deposited just before the beginning of the Quaternary (microstratigraphy). In the year 2023, during the congress that will be organized by the International Union for Quaternary Research in Rome, the GELSTRAT program will be formalized, bringing together all international research groups working on stratigraphy of the Neogene/Quaternary boundary defined at the Monte San Nicola section, near Gela, Sicily. Aim of this is to confirm the correlative potential of the Global boundary Stratotype Section and Point (GSSP) of the Quaternary, using all available methodology. Polish site, responsible for the ‘Nicola’ bed sub-project, will influence and integrate the research being conducted in laboratories around the world. In collaboration with an international team of experts representing different disciplines of earth sciences, modern research methods will be used to study the interdependence of mechanisms affecting the earth system, including the geological record of global climate changes in the Mediterranean region. This will allow for gaining a deep understanding of environmental changes during one of the most critical 'moments' in Earth's history, when the transition from a warm to a cool world coincided with the intensification of glaciations in the northern hemisphere. The unprecedentedly high resolution of the proposed research will allow for an exceptionally detailed understanding of the mechanisms responsible for current and future climate. This project will provide the necessary data for future computer simulations of ‘short’ slice of time to approximate the answer to one of the fundamental questions regarding the (in)stability of the Earth's system and the future of our planet.