Accurate point positioning is critical not only for the proper functioning of positioning techniques, but also for measuring changes that are fundamental sources of knowledge about the Earth and its dynamics. Research is ongoing to improve the accuracy of the description of global processes defined by satellite geodesy, such as sea level changes, glacier mass balances and changes in the Earth's gravitational field. It is therefore necessary to continuously improve the definition and realisation of the Terrestrial Reference Frames (TRFs) that describe these changes. Within the Global Geodetic Observing System (GGOS), a flagship component of the International Association of Geodesy (IAG), a global TRF accuracy of 1 mm and a stability of 0.1 mm/year has been postulated. To achieve this, it is essential to improve the quality of data from the four main space geodetic techniques: Very Long Baseline Interferometry (VLBI), Satellite Laser Ranging (SLR), Global Navigation Satellite Systems (GNSS) and Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS).

SLR plays a key role in the realisation of TRFs as it is the primary and only technique for defining the origin of TRFs and also contributes to the definition of the scale. Since October 2013, due to problems with VLBI solutions, SLR has been the only technique defining the scale in the latest realisation of the International Terrestrial Reference Frame (ITRF). Thus, since 2013, SLR has been responsible for two of the three components that define the ITRF (the scale, the origin and the orientation). It also has a crucial role in determining the Earth's gravitational field, which varies over time due to the redistribution of mass in the Earth system. Thanks to SLR observations, gravitational potential models will be supplemented with coefficients such as C_{20} (Earth flattening) and C_{30} (parameter describing the differences between the northern and southern hemispheres) in models from dedicated missions such as GRACE Follow-On (Gravity Recovery and Climate Experiment). With SLR, we can fill data gaps and validate them as an additional source of information on the Earth's gravitational field. Beyond these applications, SLR also contributes to determine and validate the orbits of active satellites and space debris, and to measure effects related to general relativity. The importance of SLR for the realisation of the TRF and its wide range of applications requires every effort to improve the quality of the data provided by this technique.

The objective of the project is to improve the quality of future generation Satellite Laser Ranging solutions by improving the ground and space segments, i.e. stations and satellites, based on simulated observations. This will involve optimising the operation of the SLR station network through a comprehensive analysis of performance, technical capabilities, operational standards and the challenges currently faced by the International Laser Ranging Service (ILRS) in terms of activity and data sharing due to aspects of modern geopolitics. The project will also analyse the benefits of low-cost mini-stations compared to high-cost classical SLR stations, in particular the trade-off between future investments in the space segment (more geodetic satellites) versus improvements in the ground segment (more stations, more observations, better data quality).

The STRONGER project aims to provide clear guidance and recommendations to improve the accuracy and quality of the SLR technique, ensuring that data provided by satellite laser measurements are reliable and credible. This will directly improve the ability to monitor Earth dynamics through more accurately realised TRFs and more accurate models of the Earth's gravitational field. This will lead to a better understanding of the Earth's geophysical processes, resulting in improved prediction of natural disasters and climate change impacts, which is essential for making informed and appropriate decisions for the safety of communities. The results of the project will provide valuable insights into whether future investment should focus on improving ground stations or launching new satellites, ensuring a more efficient use of resources.