Sea level rise is a direct consequence of global climate warming and will affect hundreds of millions of residents of coastal plains and river deltas in the coming decades. Constructing meaningful projections, however, requires an accurate quantitative understanding of current sea levels and their components, especially in relation to uplifting or subsiding coastlines. The latter, in particular, are important because they cause sea level to rise even faster than expected.

The rate of rising or subsiding coastlines is determined using observations from the Global Navigation Satellite System (GNSS), which was created to precisely position points on the Earth's surface. Over the years, however, it has proven that it can be useful for geodynamic studies, among other things. Although the number of permanent GNSS stations worldwide already exceeds 21,000, many coasts are still inadequately covered with stations. For such sites, Interferometric synthetic aperture radar (InSAR) observations, or the differences between satellite altimetry observations and observations acquired by tide gauges, are used to determine their subsidence rates. However, the rate of subsidence is usually determined as a rate over the years using only one of the above techniques. In this project, we propose a novel estimation of the rate of coastal subsidence of Europe and Southeast Asia based on the integration of the three techniques with each other and interpolation of coastal subsidence values from month to month. This will make it possible to obtain an integrated model of coastal subsidence with observations every month, rather than as a single rate over the years, as before. Our approach will allow qualitative and quantitative assessment of coastal subsidence, as well as analyses of sea level rise in a regular grid along the coasts. We will conclude the project with simulation experiments that will consider to what extent the future addition of ultra-precise optical clocks to the geodetic infrastructure at the tide gauge site would improve the monitoring of both sea level rise and subsiding coastlines.