



Monitoring of Landslides using Repeated Kinematics GPS Observables in Sevketiye Town, Biga Peninsula, Çanakkale, NW Turkey

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Landslide is one of the most important natural events, and is also a result of earth's crust movements. Landslides generally result in the outward and downward movement of slope-forming materials consisting soil, rock, artificial fill and etc. Moreover, possible earthquakes are one of the main reasons of triggering landslides in active areas seismically. There have been many studies based on the Global Positioning System (GPS) observables to compute the three dimensional positioning of established sites, and to model landslides precisely. We can monitor landslide with GPS using continuous data collection or the type of campaign surveying. While continuous data collection provide a millimetre-level of accuracy, the accuracy decreases with the shorter sessions, e.g. campaign surveying, due to possible sources of error.

The area, located west of the Çanakkale, has been studied to identify the landslide susceptibility and geology. Çanakkale, NW Turkey, is located on the territory of the Biga Peninsula and the Gallipoli Peninsula. The section of remaining at the west of the line from the Gulf of Edremit to the Gulf of Erdek is called Biga Peninsula, and it covers an area of approximately 10 thousand km². In the Biga Peninsula, the main morphological units are at the western, northern and southern of coastal plains, and on their behind the hills, plateaus and mountainous areas of the inland. But at the middle areas, it is often possible to find the tectonic depressions sandwiched between the masses plateau and mountainous. In general, moving down the slope of a rock, soil or debris can be defined as landslides that are ranks second in terms of caused losses after earthquakes in Turkey. Landslides, harm to urbanization as well as loss of lives and economic losses. Moreover they adversely affects to agricultural, forest areas and the quality of the rivers. For example, the gas pipeline connecting Turkey and Greece, which will provide gas to the Southern Europe passes through the Biga Peninsula. This pipeline has been damaged due to a landslide occurred in February 2006. It is essential to temporal monitoring of urban areas, transportation and infrastructure facilities against the possibility of landslides. Landslide hazards are evaluated in the earthquake and heavy rainfall processes that are the most important factors triggering landslide, and as a result the size of the hazards is estimated lower than the fact. In Çanakkale, the climate prevails in transition climates of the Mediterranean and Black Sea. So the main source of water in the project areas is meteoric water that is the most important component of the hydrological cycle. Moreover a big earthquake can trigger landslides when the ground is saturated by water in the period of between December and April. There are many landslides depending on the region's high sloping topography. It should be paid attention to aspect of movements of these landslides that could threaten residential areas the long-distance transport network and infrastructure. Conventionally, landslides are monitored by sampling of soil, rock, slope, land cover, underground water level, geology in the field and so on.

The purpose of this study is to analyze the spatial and temporal behavior of the landslide located in Şevketiye Town, Çanakkale, NW Turkey. A network consisting of 16 sites has been designed surveyed three times from 2013 to 2014 using GPS. The deformation analysis has been performed in order to model the parameters of movements for the landslides based on the GPS sites using three epochs. The rates of determined deformation are summarized by strains, velocities and also displacements. Thereby, all the landslide region can be easily characterized using the GPS sites of the network. Individual GPS sites showed various statistical properties due to their relative movements.

Keywords: Landslide, GPS, Deformation, Monitoring, Strain