LATE CENOZOIC GEODYNAMIC EVOLUTION OF SIMAV FAULT AND SURROUNDINGS, NW TURKEY

***Erdem GÜNDOĞDU[1] and Süha ÖZDEN[2]**

[1]*Çanakkale Onsekiz Mart University, Çan Vocational School, Mining and Mineral Extraction Department*

erdem@comu.edu.tr

[2]*Çanakkale Onsekiz Mart University, Engineering Faculty, Geological Engineering Department*

ABSTRACT

This study aimed to determine the Late Cenozoic geodynamic evolution of the Simav Fault and surroundings using kinematic analysis of fault assemblages obtained from microtectonic data in the field, dating of fault planes, plutonic and volcanic rocks, and some seismotectonic data. The result of kinematic analysis of fault assemblages identified the presence of tectonic regimes with four stages from the Late Pliocene to the present day. The chronological relationship of these tectonic regimes was determined by examining different kinematic behavior (slip vectors) overlying each other on fault planes. The oldest tectonic regime was a NE-SW compressional regime (σ1=48°/24°, σ3=320°/10°, R=0,341) represented by strike-slip faulting. The later tectonic stages were normal faulting due to a NW-SW extensional regime (σ1=73°/75°, σ3=309°/8°, R=0.307), and strike-slip faulting due to a NW-SE compressional regime (σ1=141°/38°, σ3=239°/10°, R=0.441). The youngest and currently continuing stage of the four-stage tectonic regime is a NNE-SSW extensional regime (σ1=40°/72°, σ3=43°/13°, R=0.574) observed as normal faulting in the field.

The NNE-SSW extensional regime is the latest tectonic regime in the study area represented mainly by north-dipping normal faulting. With strike-slip character formed in the first period, the Simav Fault currently has normal fault characteristics as a product of the current NNE-SSW extensional regime.

The most important data that this tectonic regime observed throughout the whole study area is currently effective is that in all units observed in the field from old to young, the topmost overlying slip vectors have normal fault character. Additionally the inverse solution focal mechanism of the earthquake on 19 May 2011 (M:5.8) gives normal faulting. The initial age of this current deformation is Quaternary, with the last tectonic regime change in the region occurring at the end of the Late Pliocene. The reason for this is that no strike-slip deformation is observed in any of the Quaternary age units in the study area. One of the biggest reasons is that regionally there is no regional strike-slip deformation in W-SW Anatolia in the Pliocene. Currently the effective regional tectonic regime type is a NNE-SSW extensional regime according to numerical data obtained as a result of kinematic analysis.

The results of dating studies of samples obtained from fault planes with strike-slip character on the Simav Fault determined the initiation age of the fault was between 25.3±0.8 Ma (Late Oligocene/Chattian) and 19.8±0.5 Ma (Early Miocene/Burdigalian). According to dating studies of fault planes from the other significant tectonic element in the study area of the Simav Detachment Fault, the initiation age of this fault was determined to be in the interval from 26.5±0.9 Ma (Upper Oligocene/Chattian) and 20.6±0.6 Ma (Early Miocene/Aquitanian). As the Simav Fault cuts the Simav Detachment Fault it is younger, as observed in the field and on geological maps. However, when dating and newly evaluated dating results are examined, these two faults have similar ages. As a result it should be considered that these two faults may have worked together.

Samples dated from fault planes on the Simav Fault produce age data from the time when the fault had strike-slip character (25.3±0.8 Ma and 19.08±0.5 Ma). Currently the Simav Fault has normal fault characteristics. However, the date of the transition of the Simav Fault from strike-slip to normal character, in other words, the tectonic regime change, is not fully known but may be considered to be Late Pliocene or younger.

Dating studies of the Eğrigöz and Koyunoba plutons in the region (25.6±0.7 Ma-22.6±0.7 Ma) have revealed that the uplift of these plutons may be related to the Simav Detachment Fault (26.5±0.9 Ma-20.6±0.6 Ma). While the region displayed crustal uplift during a compressional regime, this was offset by lateral strike-slip faulting. Over time the presence of new volcanism in the region was identified (20.7±0.6 Ma-7.4±0.3 Ma). When dating results obtained from volcanism are examined, this activity covers a long period or was intermittent and a second period of volcanic activity may be considered to have occurred.

Key Words: Geodynamic events, geochronology, radiometric dating, tectonic regime changes, Simav.