Earthquake Destruction at Antiochia ad Cragum and Blandus in Western Turkey: a perspective from geoarchaeology

Introduction

The geoarchaeological investigation carried out at the Roman Imperial temple at Antiochia ad Cragum and Byzantine portico at Blandus (Figure 1) further tests hypotheses that earthquakes aided in their destruction (see Erdogmus et al. 2011). The results contribute to the understanding of the social context of the structures in relationship to destruction events and introduces the advantages of using geoarchaeological methods in archaeoseismic excavations.

Geological and Historical Background

The sites of Antiochia ad Cragum and Blandus are located in the Mediterranean-Himalayan earthquake zone where major faults cause shallow, frequent, and large earthquakes. Since 1900 earthquakes ranging in magnitude from Mw 4 - Ms 7 and have resulted in death and destruction in the area of Antiochia ad Cragum. Furthermore, the sites are located within the region of the so-called ‘Early Byzantine Tectonic Paradox’ in which a series of earthquakes occurred during the fourth to sixth centuries A.D. as attested in historical and archaeological data (Stiros 2001). It is within this context that a hypothesis for the earthquake destruction of the Antiochia ad Cragum temple is further investigated.

Methods: soil micromorphology

Rapp (1986) has made the suggestion that researchers should pay more attention to soils and sediments in archaeoseismic investigations. In particular, the geoarchaeological method of soil micromorphology can allow for more site-specific analyses and for strong chronological linkages to be made between observed destruction and earthquake events. Soil micromorphology is the study of features and structures of undisturbed soils at the microscopic level. Earthquakes have an impact on soil formation and also have the potential to leave seismically induced soil-sediment microstructures, which can be identified in thin section analyses using a petrographic microscope (Cetin 1997; Frigerio et al. 2017; Matsuda 2000; Menzies and Taylor 2003).

Examples of seismically induced microstructures include fluid escape features and deformation in the form of intense folds, collapse, sag, and load structures, micro-faults, and fractures (Menzies and Taylor 2003) (Figure 2). If these types of microstructures can be identified in the stratigraphy associated with collapsed structures at Antiochia ad Cragum and Blandus, then an earthquake can be more securely associated with the observed archaeological evidence of architectural destruction.

Results and Interpretation

The various accumulations of colluvium in the stratigraphic sequence at Antiochia ad Cragum are attributed to the temple’s setting on a steep hillslope. Furthermore, the construction of a large terrace wall (see Figure 5) running the width of the temple reflects human efforts to minimize or stop the downslope movement of soil. The accumulation of boulders and mortar in a layer ranging from c. 26-50 cm is interpreted to be building debris from a destruction event (Figures 6, 8). The c. 40-50 cm accumulation of colluvium under the building debris in the northeastern corner (Figure 6) demonstrates that the building discontinued in function prior to its larger destruction in a later period, since colluvium accumulates gradually whereas the building debris appears to have occurred more suddenly.

Conclusions

The geoarchaeological investigation provides insight into human and geologic forces surrounding the structural destruction at Antiochia ad Cragum and Blandus. Furthermore, it introduces the advantages of using sampling techniques and methods of soil micromorphology in archaeoseismic excavations. The soil micromorphological analyses of thin sections of the sampled areas will provide further detailed information in determining how earthquakes may or may not have factored into the temple’s building destruction.

References


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