Experimental investigation of cumulative effect on thermal maturation of carbonaceous material by repeated earthquakes

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Thermal maturation of carbonaceous material (CM) is one of the useful proxies for frictional heat in fault during earthquakes. As temperature rises, CMs release weak chemical bonds and transfer into graphite structure above ca. 800 ˚C. Various techniques (infrared spectroscopy, Raman spectroscopy, mass spectrometry, elemental composition analysis, vitrinite reflectance measurement, etc.) have been used in previous researches. However, it has not been considered whether the effects of repeated seismic events with frictional heating. Thus, in this study, we conducted infrared and Raman spectroscopic analysesand vitrinite reflectance measurements of bituminous coal and anthracite after heating 1, 10, and 100 times at each temperature (100, 300, 500, 700, 900, 1100 and 1300 ˚C).No difference in spectroscopic features depending on the numbers of time. In contrast, bituminous coals heated at 500 ˚C for 8, 16 hours and at 600 ˚C for 8 hours showed a disappearance of aliphatic CH chain. Therefore, it is concluded that thermal maturity hardly progresses under rapid heating such as seismic slip even though the events reached to 100 times and that the maximum temperature recorded, revealed by thermal maturation of CM in fault could correspond to the largest earthquake event experienced.

Keywords: repeated eathquakes, frictional heating, carbonaceous material, spectroscopic analysis

