

Offset clusters on the Haiyuan Fault and its implications to earthquake rupture pattern

REN, Zhikun^{1*}

¹State Key Laboratory of Earthquake Dynamics Institute of Geology China Earthquake Administration

Abstract We use airborne LiDAR data to re-evaluate the single-event offsets of the 1920 Haiyuan Ms 8.5 earthquake and the cumulative offsets along the western and middle segments of the co-seismic surface rupture zone. Our LiDAR data indicate the offset observations along both the western and middle segments fall into groups. The group with minimum slip amount is associated with the 1920 Haiyuan Ms 8.5 earthquake, which ruptured both the western and middle segments. Our research highlights two new interpretations: firstly, the previously reported maximum displacement of the 1920 Earthquake is likely to be due to at least two earthquakes; secondly, Our results reveal that the Cumulative Offset Probability Density (COPD) peaks of same offset amount on western segment and middle segment did not correspond to each other one by one. We suggest that any discussion of the rupture pattern of a certain fault based on the offset data should also consider fault segmentation and paleoseismological data; Therefore, using the COPD peaks for studying the number of palaeo-events and their rupture patterns, the COPD peaks should be computed and analyzed on fault sub-sections and not entire fault zones.