

EGU2020-13090

<https://doi.org/10.5194/egusphere-egu2020-13090>

EGU General Assembly 2020

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## Strain patterns of Sichuan and Yunnan, China from GPS data and comparison between seismic and geodetic moment release

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We processed data from ~600 GPS stations, covering the period 1999-2018, to provide new insights into the crustal motion and deformation of Sichuan and Yunnan, China. We used the derived velocity field to evaluate two-dimensional strain rate tensors, and mapped the main, maximum shear, dilatation, east-west and north-south strain rates. The spatial distribution of the main strain rate in the Sichuan-Yunnan region generally shows an orderly deflection. The minimum principal strain rate is northeastward in the west of the Sichuan-Yunnan block boundary, gradually deflects eastward and southeastward toward the east and south, and returns to the northeast direction until the southwestern edge of Sichuan-Yunnan. This reflects the complex tectonic dynamics background of the study area. The high value of the maximum shear strain rate is mainly distributed along the eastern boundary of the Sichuan-Yunnan block, especially near the Xianshuihe-Xiaojiang fault, where the maximum shear strain rate exceeds  $4.0 \times 10^{-8} / a$ . The area strain rate in the study region shows that the areas of compression and expansion are comparable, with weak tensions prevailing in the interior and compression in the marginal areas. The strain rate result also shows that the east-west strain rate component in the southern Sichuan-Yunnan is dominated by positive value, and the north is dominated by negative value. It indicates that the east-west deformation in the south of the Sichuan-Yunnan is dominated by expansion, and in the north is dominated by contraction. The north-south component strain rate shows that there is a significant positive high-value zone in and around the Xianshuihe fault zone, while southern Sichuan-Yunnan is a more significant negative-value zone, and the distribution of negative high-value zones is controlled by the south boundary of the Sichuan-Yunnan block. Based on the fault activity and focal mechanism data, the study area was divided into several seismic source zones. We translated the geodetic strain rates into rates of seismic moment release in each zone and compared them with earthquake catalog-based moment rates, to evaluate the potential of seismic activity of the region. The analysis shows the geodetic strain is completely released seismically for most of the study area. However, for the southern Yunnan the geodesy-based moment rates are more than 2 times higher than the earthquake-based rates. This result indicates that at least a large earthquake may occur in southern Yunnan in the future.