Geophysical Research Abstracts
Vol. 21, EGU2019-14559, 2019
EGU General Assembly 2019

Structural analysis of regional fault-related fractures reveals Neotectonics in intracratonic setting of South America (NE border of the Parana Basin)

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In the present work we present the evidence of the effect of Neotectonic as revealed by the surface, brittle deformation associated to a regionally sized corridor characterized by a network of nearly E-W trending faults. This corridor affects the Northeastern border of the Paraná Basin (Brazil) and specifically includes the São Pedro and Botucatu ridges. The deformation zone of the studied fault strands are systematically characterized by the presence of nearly orthogonal fracture sets, interpreted as systematic and non-systematic fractures often cutting through Quaternary deposits.
An original methodology of fault and fracture inversion by Monte Carlo approach is used to infer multiple paleo-stress fields. The method provides the best orientation of the principal paleo-stresses with an estimate of the associated error. At each step of the converging inversion process, faults and fracture are uniquely associated to the stress tensor that provides the lowest error.
Results showed the poly-phased tectonic history of the studied intracratonic deformation corridor and the computed paleo-stresses are compatible with a regional strike-slip motion. This is confirmed by previous lineament domain analyses from remotely sensed data revealing that the topographic morphology of São Pedro and Botucatu region bears the signature of a strike-slip tectonics younger than Neogene times.
The integration of the evidences of tectonic deformation from remote sensing data and from fault-related fracture inversions allowed preparing a tectonic evolutionary model of Southeastern Brazil that well fit the regional geodynamic setting of South America.