Intraplate seismicity in mid-plate South America: correlations with geophysical lithospheric parameters

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Abstract

Mid-plate South America remains one of the least studied regions of intraplate seismicity. Little is known about the origin and controlling factors that make this area the least seismically active intraplate region in the world. We analyzed the distribution of intraplate seismicity and its correlation with several geophysical and geological lithospheric parameters in an attempt to establish which factors might promote or inhibit the occurrence of intraplate earthquakes. We found that above average seismicity occurs mostly in Neoproterozoic fold belts, associated with areas having a positive gravity anomaly, lower elastic thickness, higher heat flow, thinned crust and a negative S-wave anomaly at 100 km depth (associated with non-cratonic crust). Cratonic areas with a higher elastic thickness and lower heat flow are associated with low rates of seismicity. Our study suggests that the most important controlling factors are elastic thickness and heat flow. We propose that earthquake-prone areas with these favorable conditions correspond to regions of weakened lithosphere, where most of the regional lithospheric stresses are supported by the overlying brittle upper crust. These areas act as local concentrators of the regional compressional stress field, with the stress build-up then leading to the occurrence of intraplate seismicity.

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