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First-order estimate of the Canary Islands plate-scale stress field: Implications for volcanic hazard assessment

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In volcanic areas, the existing stress field is a key parameter controlling magma generation, location and geometry of the magmatic plumbing systems and the distribution of the resulting volcanism at surface. Therefore, knowing the stress configuration in the lithosphere at any scale (i.e. local, regional and plate-scale) is important to understand the distribution of volcanism and, subsequently, to interpret volcanic unrest, forecast the occurrence and potential tectonic controls future eruptions. The objective of the present work is to provide a first-order estimate of the plate-scale tectonic stresses acting on the Canary Islands, one of the largest active intraplate volcanic regions of the World. For this, we perform a series of 2D finite element models of plate scale kinematics assuming plane stress approximation in order to obtain the orientation of the minimum and maximum horizontal stresses. Results obtained are used to develop a more regional model, which takes into account recognized archipelago-scale structural discontinuities. Maximum horizontal stress directions obtained are compared with available stress, geological and geodynamic data. The methodology used may be easily applied to other active volcanic regions where a first order approach of their plate/regional stresses is essential information to be used as input data for volcanic hazard assessment models.This research was founded by the Ramón y Cajal contract (RYC-2012-11024).