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Forearc Deformation and Subduction Parameter Variability along-strike the Chilean Plate Boundary

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We present newly compiled data of the present-day geometric, kinematic and mechanic properties and their variations along-strike the oblique Chilean subduction margin between 20˚S and 45˚S. The data are used to weigh the competing influence of subduction parameters on forearc deformation, whereupon the main focus lies on present and past formation of margin-parallel strike-slip systems. Among the parameters considered are the plate kinematic boundary conditions (e.g., convergence obliquity and rate, dip of slab), overriding plate heterogeneities that affect its capability for localizing horizontal shear (e.g., thermal and structural weaknesses) or resistance to block motion (e.g., plate margin curvature) as well as properties governing or imaging the force interaction at the plate interface (e.g., trench sediment-fill, geodetic and seismic coupling depth).

Most remarkably, the short-term GPS-derived forearc velocity field, dominated by elastic loading processes, shows little variation along-strike the margin, despite the significantly changing boundary conditions (e.g., trench sediment-fill, mass transfer mode at tip of overriding plate, plateau or no plateau, slab-dip variations). Variations in recent and past strike-slip motion appear not to depend on convergence obliquity or rate, nor on the mode of mass transfer at the subduction front (erosive or accretive). A southward increase of the frictionally coupled area on the plate contact and a decreasing taper along the Chilean margin can be reconciled in the framework of taper theory by a southward decrease of the coefficient of friction on the plate interface, possibly due to the subduction of wet sediments. The development of forearc slivers seems to be primarily controlled by mechanisms that cause effective rheological weakening of parts of the upper plate and by geometries that hamper margin-parallel sliver motion. While the trenchward concave-shaped margin in North Chile hampers margin-parallel

motion of a forearc sliver, the present strike-slip activity of the Liquiñe-Ofqui Fault Zone in southern Chile is likely facilitated by the superposition of two conditions: a shallow dipping slab and exceptionally small arc to trench distance.