



## **Are subduction zones inherently weak?**

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An outstanding question in geodynamics is how weak are plate boundaries when compared to their interiors? Particularly, how weak are subduction zone interfaces? Because subduction is believed to be the major driver of plate tectonics, this question is of fundamental importance for geodynamics. Several lines of evidence suggest that subduction zones are weak and that the unique availability of water on Earth plays a key role. We have evaluated the strength of subduction zone interfaces using two approaches: i) an empirical relationship between shear stress at the interface and subduction velocity, deduced from laboratory experiments of subduction; and ii) a parametric study of natural subduction zones that provides new insights on subduction zone interface strength. Our results suggest that subduction is only mechanically feasible when shear stresses along the plate interface are relatively low (< 33 MPa). To account for this global requirement, we propose that there is a feedback mechanism between subduction velocity, water release rate from the subducting plate and serpentinization and weakening of the forearc mantle that may explain how relatively low shear stresses are maintained at subduction interfaces globally.