The impact of having a subduction channel or a subduction fault

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At convergent plate boundaries, the properties of the actual plate contact are important for the overall dynamics. Convergent plate boundaries both mechanically decouple and link tectonic plates and accommodate large amounts of strain. We investigate two fundamental physical states of the subduction contact: one based on a fault and the other based on a subduction channel.Using a finite element method, we determine the specific signatures of both states of the subduction contact. We pay particular attention to the overriding plate. In a tectonic setting of converging plates, where the subducting plate is freely moving, the subduction channel reduces compression relative to the fault model. In a land-locked basin setting, where the relative motion between the far field of the plates is zero, the subduction channel model produces tensile stress regime in the overriding plate, even though the amount of slab roll-back is small. The fault model shows a stronger development of slab roll-back and a compressive stress regime in the upper plate. Based on a consistent comparison of fault and channel numerical models, we find that the nature of the plate contact is one of the controlling factors in developing or not of back-arc extension. We conclude that, although roll-back is required as an underling geodynamical process to produce back-arc extension, there is not a one-to-one relationship between roll-back and stress regime in the overriding plate. The type of plate contact plays a decisive role in controlling the back-arc state of stress.