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# Dynamics of slab rollback and consequent back-arc basin formation

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The formation of back-arc basins is one of the distinctive characteristics of subduction zones. We performed a numerical study to understand the dynamical mechanisms of slab rollback and the resulting back-arc basin formation by using two-dimensional dynamic numerical models of an integrated plate-mantle convection system. Retrograde slab migration is generated when the slab stagnates in the transition zone or when the deep section of the slab is vertical. In both cases, slab rollback is generated because the deep slab section obstructs the descending motion of the shallow slab section with an inclination. Buoyancy of the 660-km phase boundary acts as the obstructing force in the case of stagnant slab formation, and an anchoring force against the horizontal motion works similarly in the case of vertical slabs. To balance the horizontal component of the obstructing force, a suction force at the plate boundary pulls the overriding plate toward the ocean. Back-arc spreading is produced by means of slab rollback when the overriding plate with a weak back-arc area is fixed to the model boundary. The back-arc deformation becomes compressional when the overriding plate is freely movable despite trench retreat, because the wedge mantle flow viscously drags the overriding plate toward the trench. This implies that forces tending to actuate the overriding plate away from the trench are necessary to generate back-arc extension even when trench retreat is generated by slab rollback.

Keywords: slab rollback, back-arc basin, subduction zone, mantle convection, numerical modeling