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Subduction zones interaction in the Central Mediterranean: focusing on Adria

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At present, it is widely accepted, that geometric, kinematic and dynamic features of the near-surface regions around subduction zones are controlled by slab-mantle interactions. Slabs are sinking and laterally moving in the mantle, inducing a mantle flow pattern with poloidal and toroidal components. The poloidal flow exerts vertical pressure, while the toroidal component exerts a shear stress on the base of the base of the lithosphere. Slabs can interact also with each other, via the dynamic pressure and the flow in the mantle, or by stress propagation in the more rigid lithosphere. The study of slab-slab interactions has come to the front of geodynamics researches to better explain geological and geophysical observations from tectonically complex areas. A key area to test models with multiple slabs is the Central Mediterranean, where minimum three subduction zone affected the region's tectonic evolution. One of the key features in the Central Mediterranean is the Adria plate, subducting on its two opposite sides. Additionally, the slab below the Central-South Apennines has been progressively breaking off during the last 2-3 Myr. The role of an outward dipping double-sided subduction system combined with an opening slab window is addressed by analog models at the scale of the upper mantle, realized using glucose syrup and silicone putty, to model the interaction between the Earth's mantle and the lithosphere. Our results show that the double subduction system has a regional effect through the induced mantle flow. Furthermore, the presence of a slab window modifies the pattern of mantle circulation, as well as the trench geometry and kinematics. In particular, the opening of the slab window induces the formation of two arcs flanking the window, while the mantle flows through it and turns towards the arcs, creating a small-scale toroidal flow. The effect of a slab window is more pronounced on double subduction systems, as the outflow through the window is amplified, while internal deformation is induced in the plate by the opposite slab pull force. These experimental results suggest that the origin of the Apenninic and the Calabrian arcs is the result of the formation of a slab window, providing a new interpretation of the surface deformation and the SKS shear wave splitting pattern of the Adria microplate.