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Is lateral extrusion in the Eastern Alps influenced by the back-arc extension in the Pannonian Basin? Insights from analogue crustal scale models.

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The influence of slab-pull induced extension in the Pannonian Basin on lateral extrusion processes in the Eastern Alps has been studied through analogue crustal scale modelling. Extension at high angle to the shortening direction has been implemented in the models; these are analogues for the northward convergence of the Adriatic plate and the coeval back-arc type extension in the Pannonian Basin. Analyzing and comparing models was done with particle tracing techniques (DPIV) which enables to calculate surface vector fields and visualize active faults. The amount, timing and direction of extension were varying parameters. Furthermore, a series of models was included with a 20 degrees counter clockwise rotation of Adria and a model which implemented a Bohemian Massif type boundary in the north thereby decreasing the width of the area that can accommodate deformation. After deformation all models featured a compressional, strike-slip and tensional domain from west to east, respectively. The strike-slip (extruding) domain shows 'en-bloc' rotations in response to displacement velocity variations. The crustal blocks are bounded by conjugate strike-slip faults which is indicative for lateral extrusion processes. When extension is present the amount of rotation increases, the extruding domains propagate further to the west and the direction of extrusion is parallel to the direction of extension. When extension was ceased whilst convergence continued the extruding domain decreased in size but remained active. Including rotation of Adria resulted in the absence of conjugate strike-slip faults and the area that accommodated extrusion decreased. Thus, an indenter rotation has a negative effect on the lateral extrusion process. However, when a Bohemian Massif type boundary was present the negative effects were compensated. Compared to models without rotating indenter an increased amount of conjugate fault sets were present. The results imply that slab-pull driven extension in the Pannonian domain facilitates the lateral extrusion processes in the Eastern Alps and determines the direction of lateral displacements. A 20 degrees counter-clockwise rotation of Adria does not enhance lateral extrusion whereas the presence of the Bohemian Massif does, as it fosters the formation of extrusion type fault systems. Furthermore, ongoing lateral extrusion despite stagnation of back-arc extension is in line with recent GPS data.