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Outcrop-scale tomography: insights into the 3D structure of multiphase boudins

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We analyze a boudinaged amphibolite layer encased in marble using meter-scale tomography by serial sectioning, high resolution imaging and 3D reconstruction of a block selected from a large continuous outcrop in the high-grade core of the Naxos core complex. Uncertainties in the model are resolved by dissolution of marble in selected slabs, yielding a large, highly accurate 3D model.

Results show five generations of brittle extension of amphibolite in ductile marble with variable extension direction. Most dilatancy between domino boudins is due to later reactivation – there is only little separation between domino boudins during boudinage. Shear fractures between domino boudins have relatively large throw gradients, indicating ductile rupture. Stretch indicated by shear offset on domino boudins decreases with amphibolite layer thickness, showing that with decreasing layer thickness deformation becomes delocalized, offering tantalizing glimpses of rheology under metamorphic conditions.