Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.19590

The elasticity of dolomite at mantle conditions: Implication for the origin of the mid-lithosphere discontinuity in cratons

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During the formation and evolution of cratonic continents, carbon-bearing melts can be introduced by the paleo-subduction process or mantle plumes. As the lithospheric mantle cooled down, the carbonatitic melts trapped at ~80-140 km depth would react with pyroxene and olivine in the surrounding mantle to produce dolomite. Therefore, the mid-lithosphere discontinuity (MLD) in some cratons may be a chemical layer enriched in dolomite. Here, we investigated the elasticity of dolomite at mantle conditions using *ab initio* calculations. We found the velocities of dolomite are significantly lower than those of the main minerals in the lithospheric mantle. The enrichment of ~10-35% dolomite will cause ~2-7% shear velocity reduction. Different from hydrous minerals such as amphibole and phlogopite, dolomite has an electrical conductivity similar to olivine. Therefore, the enrichment of dolomite provides a good explanation for the velocity drop of MLD in cratonic regions where no high-conductivity anomaly has been detected.