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Post-magma ocean mixing of reservoirs inside the angrite parent body

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Angrites are a rare group of mafic volcanic-plutonic meteorites with only 28 samples listed by the Meteoritical Society that formed within the first 10 Myr after the formation of the solar system. Studies of siderophile elements showed that core formation in the angrite parent body occurred at super liquidus temperatures. Despite experiencing an early magma ocean, Hf-W data suggest the presence of at least two distinct mantle reservoirs. A possible explanation for the isotopic variations (coupled with elemental variations) could be delivery of new planetesimal material during the post-magma ocean stage and imperfect mixing of the resulting mantle reservoirs. To test this theory we use the 2D/3D finite difference marker-in-cell code family I2ELVIS/I3ELVIS to study the mixing of reservoirs in bodies with radii ranging from 50 to 300 km. Numerical results show that mixing in 3D models is more efficient than in their 2D counterparts. Based on the numerical results we derive a semi-analytical scaling law describing the mixing efficiency. Using the available constraints on formation time of the angrites, the activity of an early dynamo and the modelled thermal evolution, we put constraints on the size of the angrite parent body.