

EGU2020-8964

<https://doi.org/10.5194/egusphere-egu2020-8964>

EGU General Assembly 2020

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Implementation of partial melting with a water- and composition-dependent solidus temperature adapted to TTG formation

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More and more convection codes now consider the apparition of melt when the temperature of the mantle exceeds a considered solidus temperature. How melt is treated when it appears varies a lot from one code to another. The convection code StagYY has been using an implementation in which molten eclogite is produced out of melting of mixed mantle. The melt is then teleported above ("erupted") or below ("intruded") the basaltic crust. In a recent study by Jain et al. 2019, we have shown that it is possible to also self-consistently generate continental crust (so-called TTG rocks) if the basaltic crust is entrained in the mantle and remolten. In nature, this only happens if a lot of water is present in the recycled basalt so a numerical treatment of water is necessary.

In this poster, we discuss the details of a new implementation of melting in which each cell of the convection domain is divided in several groups of different composition. Each group has a different solidus and liquidus temperature according to the composition and the water content. The solidus temperature is computed using an interpolation between composition and water concentration end members instead of using an extrapolation from the solidus temperature, as it is usually done. This ensures that TTGs form at a realistic melt fraction and provides a different view on how the continental crust of the early Earth might have formed.