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Towards a better understanding on the origin of CO_2 fluids in mineralization: a numerical study in CO_2 devolatilization and metasomatism

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While water has been well studied in recent decades and its effect on solidus temperatures, metamorphism and rheological weakening are well documented, CO_2's role in these same physical processes remains cryptic, with much contention. CO_2's origin and role in mineralization remains just as mysterious with source fluids ranging from wall-rock interactions at the mineralization site to $\delta 13CCO_2$ ratios from inclusions suggesting upper mantle origins. This study aims to chip away at and provide some limitations to CO_2's enigmatic behaviour and understand the origin of the fluid in a variety of geodynamic processes. Future work will include geodynamic settings such as subduction related devolatilization, mantle wedge metasomatism, upper mantle metasomatism and detachment related devolatilization. This work will be achieved by the use of a fully coupled petrological-thermomechanical modeling approach. The petrological and stable mineralogy will be computed by the use of Perple_X, a collection of programs to calculate and display phase diagrams, phase equilibria, and thermodynamic data. The numerical technique will be completed by use of a characteristics-based marker-in-cell technique with conservative finite-differences including visco-elastic-plastic rheologies using the P-T and mineralogical data provided by Perple_X for the coupling. The current progress exhibits the initial stages of the project illustrating the viability of the thermodynamic data and the process in which it will be coupled to the numerical model. Also, we present the first stages in the benchmarking process for a subduction zone setting; essential to ensuring the code is properly working and accurate in its implementation.