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# Metamorphic reactions, fluids release and their influence on subduction earthquakes

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t is generally accepted that two factors determine the localization of seismogenic areas: the temperature and the fluid pressure. Beneath accretionary sedimentary prisms, the transition to aseismic stable sliding is temperature controlled. The maximum temperature for seismic behavior in crustal rocks is ∼350°C. In addition, great earthquake ruptures initiated at less than this temperature may propagate with decreasing slip to where the temperature is - 450°C. Although the links among seismicity, fluids production in the subduction factory remain poorly established, fluid pressure can strongly influence the mechanical behavior of rocks; such fluid can come from in situ dehydration or be externally derived. It has been observed experimentally in numerous systems that rocks undergo sudden weakening and embrittlement (a change from ductile to brittle behavior) during their dehydration under conditions wherein the permeability is insufficient to relieve increasing fluid pressure. The embrittlement is independent of whether the same rock exhibits stable or unstable sliding in the presence of an externally derived fluid. Abundance of synmetamorphic segregations in all kind of exhumed metamorphic rocks testifies to the importance of fluid-rock interactions at all depths. These segregations are created throughout the different stages of the tectono-metamorphic evolution. Dehydration reactions during metamorphism in subduction zones represent a substantial source of fluid. We investigate by thermodynamic modeling the parameters that control fluids production and veins formation in the forearc wedge and in the slab. Our study confirms the hypothesis that the fluids involved in vein formation stem from the local rocks. No external fluid are involved. The quantity of released fluids is control by the thermal structure of the subduction as well by the chemistry of the sediments involved in the wedge.

We also show as already proposed by Delany & Helgeson (1978), that volume changes accompanying dehydration reactions contribute significantly to earthquake generation.