

Modelling and simulation of phase-change materials

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29 août 2022

The coupling between thermal convection and melting is a key phenomenon in many applications, ranging from geophysical flows (Earth's mantle formation, magma oceans) to the energy storage or passive temperature control devices using phase-change materials (PCMs). We present numerical simulations of a heated cavity filled with a pure PCM and consider both lateral (Fig. 1a) and basal heating (Fig. 1b). The former case is well documented in the literature, while the latter (equivalent to the Rayleigh-Bénard convection with melting) was less studied for confined geometries.

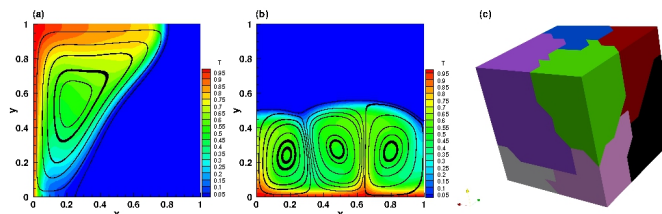


FIGURE 1 – Melting of a phase change material using lateral (a) and basal (b) heating. Temperature contours and streamlines of the flow in the liquid part. Panel (c) illustrates the domain decomposition of the cavity used for 3D simulations.

Acknowledgment : this is a joint work with L. Danaila, C. Lothodé, F. Luddens, A. Rakotondrandisa, G. Sadaka (University of Rouen Normandy).

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