

Thermal convection in the ice layer is a crucial process influencing heat transfer, the internal structure of the icy shell and the potential habitability of icy moons in the outer Solar System. Despite the known significant impact of the grain size on thermal convection behaviour, only few models have integrated grain size evolution with realistic material parameters. In this study, we develop a numerical model to investigate the effect of grain size on thermal convection in the icy shells of these moons. Utilizing the finite-element method and a tracer method implemented in the FEniCS software, the model incorporates dynamically evolving grain size with realistic constitutive relations. Our findings indicate that the behaviour of our model closely mirrors those with constant grain size, suggesting that a constant grain size is a reasonable simplification. Regions with smaller grain sizes align with areas of higher stress, while elsewhere, the grain size reaches its maximum. This underscores the necessity of further research into the maximum grain size threshold.