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REVISITING THERMAL COMPUTATIONAL MODELS OF SOLIDIFICATION PROCESSES

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PROPOSAL

Through the 1990's there was significant advances in the development of computational models of solidification processes. The end point of this work were robust codes and algorithms that could model a solidification process, e.g., an ingot casting, while accounting for the governing heat and mass transfer phenomena (evolution of latent heat, formation of mushy region, micro and macro segregation, etc.)

For the most part these computational codes employed fixed grid methodologies, (e.g., enthalpy formulations) and modelled the momentum in the region of solidification through analogy with flow in porous media. Since the initial development of these computations, while additional features have been added to codes (e.g., the relative movement of solid and liquid phases), the core components of the methodologies have essentially remained the same.

The objective of this mini-symposium is to revisit these computational models of solidification processes. The driver for this is twofold. In the first case, we recognize that there may have been advances in thermal computations that may allow us to explore and expand solidification models outside of the fixed grid paradigm — could advances in grinding techniques (e.g., embedded interfaces) and discretization schemes (radial basis functions) lead to more accurate and useful solidification models? Secondly, it is notable that many of the original solidification modelling techniques have found their way into commercial and share-ware software. The downside of this advance, however, is that some of the critical technical and physical details in setting up and implementing a given model are overlooked—a particular example is when and when not to include the advection of latent heat.

In this mini-symposium We are looking to collect papers that address either or both of these topics—papers on emerging computational methodologies that can be used to shift solidification modelling paradigms and papers that revisit and carefully explain critical details of code implementation