CFEL SCIENCE

SEMINAR

20th January 2014 - 15:00 h

CFEL – Building 99, seminar room I (ground floor)

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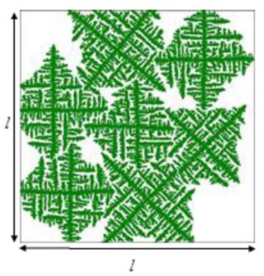
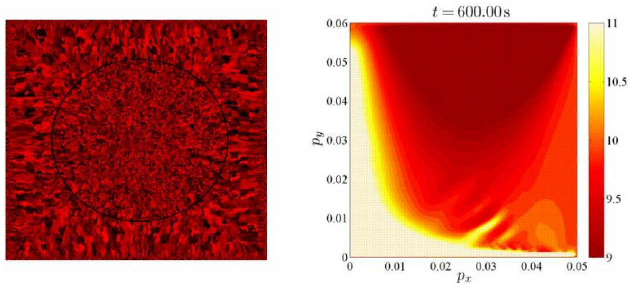
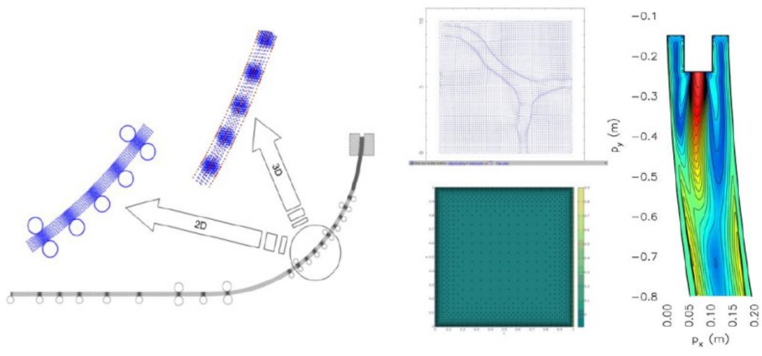
Meshless Methods for Computational Fluid Dynamics

Meshless methods represent a very fast developing field of computational mechanics. Their main distinction from classical numerical methods, such as finite element, finite volume or boundary element method is that their trial functions depend only on node arrangement, without building any geometrical objects between the nodes. This approach gives many advantages with respect to the classical methods, such as high order of smoothness, no mesh distortion problems, etc. They also perform surprisingly well in the strong form formulation, which has an additional advantage of no need for integration. They turned out to be particularly advantageous in moving boundary and inverse problems. An overview of meshless methods based on collocation with radial basis functions for multiphysics and multiscale problems will be given. Special emphasis on computational fluid dynamics issues such as adaptivity, upwinding and pressure-velocity coupling will be presented in detail, concluded by several examples from sciences and engineering.





Examples of meshless simulations of dendritic microstructure formation (left), grain structure formation (center), and macrosegregation (right).



Examples of 2 and 3D meshless node arrangements (left), h- and r-adaptive node arrangements (center), and industrial simulation of turbulent flow with solidification in continuous casting of steel (right).

Hosts: Henry Chapman / Coherent Imaging Division + Saša Bajt / FS-ML