

Existence and regularity theories of Brakke flow

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Abstract: In his pioneering work published in 1978, Brakke defined a mean curvature flow of varifold, the notion originating from geometric measure theory, to describe grain coarsening phenomena of annealing pure metal. Typically, their boundaries have singularities such as triple junctions, and varifold is just the right kind of notion to accommodate such singularities. In 2015, I proved a general existence theorem of this type of flow moving with singularities (jointly with Lami Kim) which is almost every time and almost everywhere smooth under a natural density assumption. The existence result opens up a new pathway for inquiries on the properties of mean curvature flow in a non-smooth setting. On the other hand, little beyond the existence and partial regularity is known so far. In this course, I plan to start by describing the basics of Brakke flow which is followed by an overview on the existence and regularity theories.

References:

- [1] Y. Tonegawa, Analysis on the mean curvature flow and the reaction-diffusion approximation (Part 1), Institut Fourier, Ecole d'été 2015, available via YouTube (a quick 2-hour introduction to geometric measure theory and theory of varifold).
- [2] L. C. Evans and R. F. Gariepy, Measure Theory and Fine Properties of Functions, Revised Edition, Chapman and Hall/CRC (a reference for general measure theory and the Hausdorff measure).