

# A time-global existence of mean curvature flow via reaction diffusion approximation

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Given a compact  $C^1$  hypersurface in  $\mathbb{R}^n$  ( $n \geq 2$ ) and a vector field  $u : \mathbb{R}^n \times [0, \infty) \rightarrow \mathbb{R}^n$  which belongs to  $L^q_{loc}([0, \infty); W^{1,p}(\mathbb{R}^n))$ ,  $2 < q < \infty$ ,  $\frac{nq}{2(q-1)} < p$  ( $\frac{4}{3} \leq p$  additionally in case of  $n = 2$ ), we prove some existence and regularity results for evolving hypersurfaces whose velocity is given by its mean curvature plus  $u$ . For the existence, we take a singular perturbation limit of the Allen-Cahn equation with additional transport term. The hypersurfaces remain  $C^1$  for a short time, and they are  $C^1$  almost everywhere away from the so called higher multiplicity region. This is a joint work with K. Takasao and the results have appeared in arXiv:1307.6629.