Title: Blow-ups of Caloric measure in time-varying domains and applications to two-phase problems.

Abstract: Let Ω^+ and Ω^- be disjoint time-varying domains in $\mathbb{R}^n_x \times \mathbb{R}_t$, $n \geq 2$, and let $\omega^{\pm}$ denote their associated caloric measures. Under appropriate mild non-degeneracy and regularity hypotheses on $\Omega^{\pm}$, mutual absolute continuity of ω^+ and ω^- on $E \subset \partial\Omega^+ \cap \partial\Omega^- \cap \omega^+$ implies that the parabolic Hausdorff dimension of $\omega^+|_E$ is $n+1$ and the parabolic blow-ups of ω^+ at ω^+-a.e. point of E are equal to a constant multiple of the parabolic $(n+1)$-Hausdorff measure restricted to hyperplanes containing a line parallel to the time-axis. We will also discuss a new Sobolev space on parabolic cylinders based on function spaces coming from Optimal transport that embeds compactly in L^2 as well as its application to our blow-up arguments. This is a parabolic analogue of a result of Kenig, Preiss and Toro, and its proof involves a set of techniques based on parabolic tangent measures.