Monotonicity formulae and non-collapsing estimates for mean curvature flow with applications

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Abstract: The geometric behaviour of solutions to mean curvature flow can be best controlled by proving that certain geometric quantities are monotone in time. A first example is the monotonicity formula for a weighted area functional that characterises self similar shrinking solutions in the equality case and turns out to be important for regularity results about the flow. More recent examples are non-collapsing estimates for embedded solutions to the flow that control the quality of the embedding in a quantitative way. The course explains the techniques of proof and gives applications to the understanding of singularities in the case of embedded surfaces.