Abstract. The evolution of an embedded surface under the normalized mean curvature flow is the result of a complicated interaction between the geometry of the evolving surface and the geometry of the ambient space, and is not well understood in the context of a general Riemannian manifold. In the present paper we identify a class of initial conditions, that we call "bubbles", whose dynamics is primarily determined by the ambient space. A bubble is an embedded surface that is close to a small geodesic ball; we find that its shape is robust along the evolution. Moreover, under a relatively tight condition relating shape to size, we show that the velocity of the center of the bubble is given, to principal order, by the gradient of the scalar curvature. Finally under natural conditions of compactness and nondegeneracy we show that such solutions converge, as t tends to infinity, to surfaces of constant mean curvature.