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Vortex filaments in the Euler equation

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Classical fluid dynamics arguments suggest that in certain limits, the evolution of thin vortex filaments in an ideal incompressible fluid should roughly be governed by an equation called the binormal curvature flow. However, these classical arguments rely on assumptions that are so unrealistic that it would be very difficult even to extract from them a precise conjecture that admits any possibility of a proof. We present a different approach to this question that yields a reasonable formulation of a conjecture and strong supporting evidence, and that clarifies the very substantial obstacles to a full proof. Parts of the talk are based on joint work with Didier Smets and with Christian Seis.