# Time-dependent singularities in the Navier-Stokes system

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**Abstract**

The Cauchy problem for the incompressible Navier–Stokes system in the whole three dimensional space reads

$$\begin{aligned} \partial_t u + (u \cdot \nabla)u - \Delta u + \nabla p &= 0, \quad (x,t) \in \mathbf{R}^3 \times (0,\infty), \\ \operatorname{div} u &= 0. \end{aligned}$$

We have proved that, for a given Hölder continuous curve in $\{(\gamma(t),t) \in \mathbf{R}^3 \times (0,\infty) \,:\, t>0\}$, there exists a solution to this system which is smooth outside this curve and singular on it. This is a pointwise solution of the system outside the curve, however, as a distributional solution on $\mathbf{R}^3 \times (0,\infty)$, it solves an analogous Navier-Stokes system with a singular force concentrated on the curve.

This is a joint work with **Grzegorz Karch**.

**Keywords:** Navier–Stokes system, incompressible fluid, time-dependent singularity, Slezkin-Landau solutions.