Global Solvability for Smooth Nonsingular Vector Fields in the Plane

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Abstract: We address some global solvability issues for classes of smooth nonsingular vector fields L in the plane related to cohomological equations $Lu = f$ in geometry and dynamical systems. The main result is that L is not surjective in $C^\infty(\mathbb{R}^2)$ if and only if the geometrical condition – the existence of separatrix strips – holds. For nonsurjective vector fields, we demonstrate that if the RHS f has at most infra-exponential growth in the separatrix strips we can find a global weak solution L^1_{loc} near the boundaries of the separatrix strips.
Joint work with Todor Gramchev and Alexandre Kirilov.