

Minimal boundaries in Tonelli Lagrangian systems

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In this talk we discuss some new results concerning action minimizing periodic orbits of Tonelli Lagrangian systems on an orientable closed surface M . More specifically, we show that for every energy larger than the maximal energy of a constant orbit and smaller than or equal to the Mañé critical value of the universal abelian cover, the Lagrangian system admits a minimal boundary, i.e. a global minimizer of the Lagrangian action on the space of smooth boundaries of open sets of M . We also derive existence results of (simple) periodic orbits for energies just above the Mañé critical value of the universal abelian cover. Finally, we discuss an analogue of the celebrated graph theorem of Mather in this context and explain how to use it to prove the existence of simple periodic orbits for subcritical energies on non-orientable closed surfaces.