



Birkhoff normal form and almost global existence in Hamiltonian PDEs

Dario Bambusi
(Università degli Studi di Milano)

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Aula Magna "Miguel de Guzmán", Facultad de Matemáticas,
Universidad Complutense de Madrid

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The problem of existence and qualitative behavior of solutions of evolution equations is a classical one in the theory of PDEs. In this seminar I will focus on the use of Birkhoff normal form for the proof of the so called almost global existence results in Hamiltonian PDEs. Such results deal with perturbation of linear hyperbolic equation (for example the wave equation) and ensure that solutions corresponding to smooth and small initial data remain small and smooth for times of order ϵ^{-r} , $\forall r$. Here ϵ is the size of the initial datum.

Nowadays there exists a well established theory for semilinear equations in space dimension 1, but the theory for quasilinear equations and for equations in higher dimensional domains is only at the beginning. Furthermore some remarkable applications to physical relevant models like the water wave equations have been very recently obtained.

In this Colloquium, I will review the classical theory presenting the main ideas and then I will present some of the most recent results in the domain trying to put into evidence the main tools that have been developed in order to deal with the problem.

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