Barcelona Analysis Seminar **2021–2022**

URL . https://mat.uab.cat/web/seminarianalisi/

Date. July 11, 2022

Time. 15:00 CET

Room. Room T2, Universitat de Barcelona

Online streaming (Zoom). https://ub-edu.zoom.us/j/95538016558

Global dynamics and blowup in some quadratic PDEs

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Conservation laws and Lyapunov functions are powerful tools for proving the global existence of stability of solutions, but for many complex systems, these tools are insufficient to understand non-perturbative dynamics. In this talk I will discuss a complex-scalar PDE which cannot be neatly categorized as conservative nor dissipative: $u_t = e^{i\phi}(u_{xx} + u^2)$ with $x \in \mathbb{T} \equiv \mathbb{R}/\mathbb{Z}$ and parameter $\phi \in [-\frac{\pi}{2}, \frac{\pi}{2}]$.

In a recent series of papers, together with JP Lessard and A Takayasu, we have used computer assisted proofs to show that this equation exhibits rich dynamical behavior that exist globally in time: non-trivial equilibria, homoclinic orbits, and heteroclinic orbits, and integrable subsystems foliated by periodic orbits. On the other side of the coin, we show several mechanisms by which solutions can blowup. I will discuss these results, and current work toward understanding unstable blowup and wave turbulence.