# Solitons and elliptic curves

Leonardo Santilli
Universitat de València

IV Investmat Congress.
Jan. 18th–20th, 2017.

**Abstract**

Solitons are waves arising as solutions of a nonlinear differential equation, but their behaviour resembles closely a solution of some linear equation. This peculiarity allows them to have a broad application in physics.

At the very beginning, the discovery of solitons did not receive a positive response, as they were thought to be unrealistic. It was only in the 1965, when Zabusky and Kruskal re-discovered the solitons studying a physical system, that they started to be esteemed.

Formally, a soliton is a localised solution of the so-called KdV equation. During this talk, this special equation is depicted and its relation with the elliptic curves is investigated. The topic of the last part of the exposition is the Weierstraß $\wp$ function, which is eventually used to parametrise the elliptic curves. Therefore, the aim of the talk is to show how the study of the solitons, these peculiar but physically meaningful waves, can be reduced to a simple problem of complex analysis, thanks to the Weierstraß $\wp$ function.