SIX YEARS OF RESEARCH WITH SEBASTIANO

L. Fermo, C. van der Mee and S. Seatzu
Department of Mathematics and Computer Science
University of Cagliari, Italy
`fermo@unica.it`

In the last ten years, Sebastiano Seatzu enjoyed studying nonlinear partial differential equations of integrable type (among the others [2, 3, 4, 5]). His interest laid in the applicative nature of these equations which are, for instance, used to describe electromagnetic waves in optical fibers and surface wave dynamics, and his intention was to solve them numerically following the whole path of the so-called Inverse Scattering Transform.

Such a research saw me as a co-author, along with Cornelis van der Mee, of his last eight works, of which six were published and two were incomplete.

In this talk we focus on the research which was in progress when he left us on February 13th, 2018, namely, the numerical treatment of the Korteweg-de Vries (KdV) equation which governs the propagation of surface water waves in long, narrow, shallow canals [1]

$$q_t - 6qq_x + q_{xxx} = 0, \qquad x \in \mathbb{R}, \qquad t > 0.$$

References

[1] D. J. Korteweg and G. de Vries, On the change of form of long waves advancing in a rectangular channel and on a new type of long stationary waves, Phil. Mag. 39, 422-443 (1895).

[2] A. Aricò, C. van der Mee and S. Seatzu, Structured matrix numerical solution of the nonlinear Schrödinger equation by the inverse scattering transform, Electronic Journal of Differential Equations 1-21 (2009).

[3] A. Aricò, G. Rodriguez and S. Seatzu, Numerical solution of the nonlinear Schrödinger equation, starting from the scattering data, Calcolo 48, 75-88 (2011).

[4] C. van Der Mee, S. Seatzu and D. Theis, Structured matrix algorithms for inverse scattering on the line, Calcolo 44, 59-87 (2007).

[5] L. Fermo, C. van der Mee, S. Seatzu, Scattering data computation for the Zakharov-Shabat system, Calcolo 53, 487–520 (2016).