

In this talk, Professor Pelloni will discuss her long-standing interest in the study of the solution of nonlinear PDEs modelling fluid dynamics and nonlinear waves. Motivated by her early work in numerical approximations, she will proceed to illustrate the *unified transform method*, first proposed by Fokas in the late 90s. This transform provides a general methodology that can be considered as a nonlinear version of the Fourier transform, and generalises the well-known inverse scattering transform. It can be widely applied to the study of *integrable* models, particularly to provide an analytic solution to realistic water waves propagation problems. Professor Pelloni will also briefly consider the challenge posed by the full 3D fluid dynamics, and discuss another general transform idea that she has been interested in more recently, and that makes use of *optimal transport* techniques. This transform was introduced by Hoskins in the 70s and first exploited by Brenier in the late 90s for solving analytically some specific geophysical fluid dynamics models.