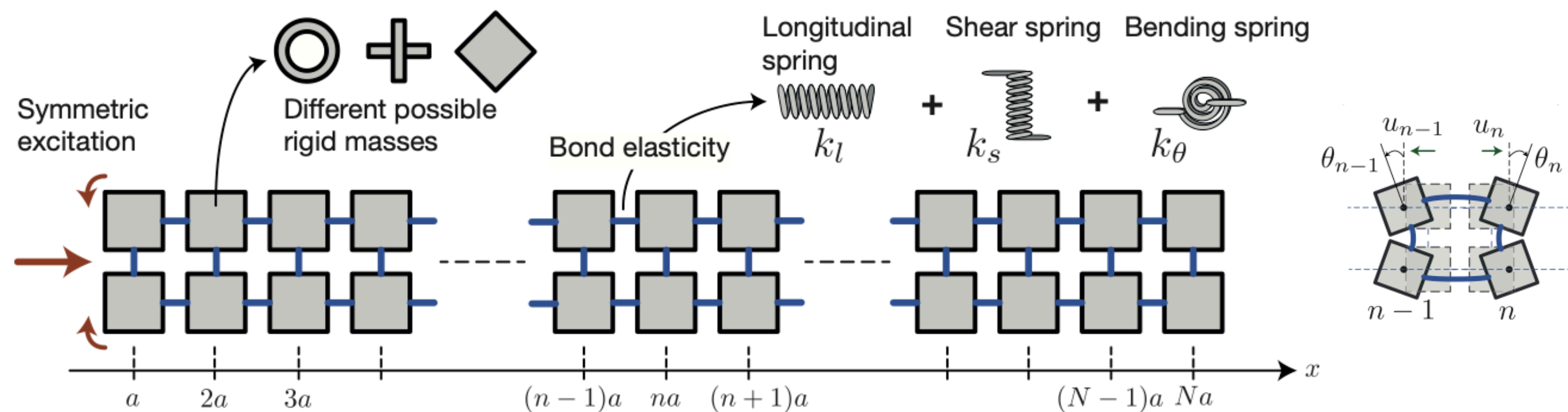
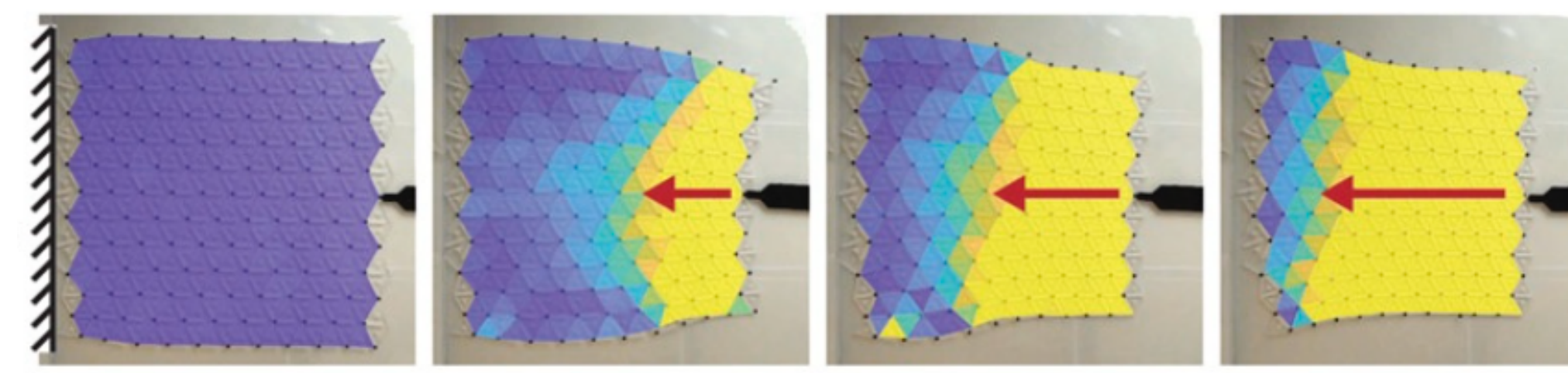


# Envelope vector solitons in nonlinear flexible mechanical metamaterials (FlexMM)



## Reconfigurable structure



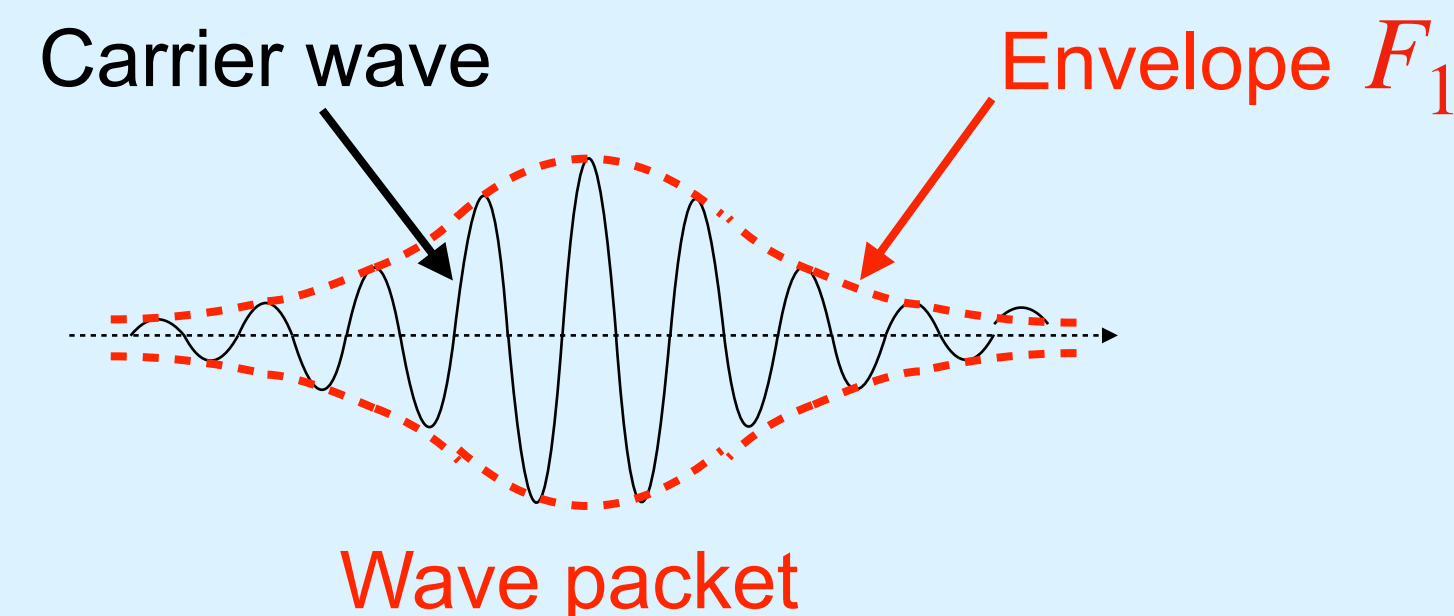
L.Jin, R. Khajehtourian, J. Mueller, A. Rafsanjani, V. Tournat, K. Bertoldi, and D. M. Kochmann, "Guided transition waves in multistable mechanical metamaterials," Proc. Natl. Acad. Sci. U.S.A. 117, 2319–2325 (2020).

- Ansatz : Modulated waves

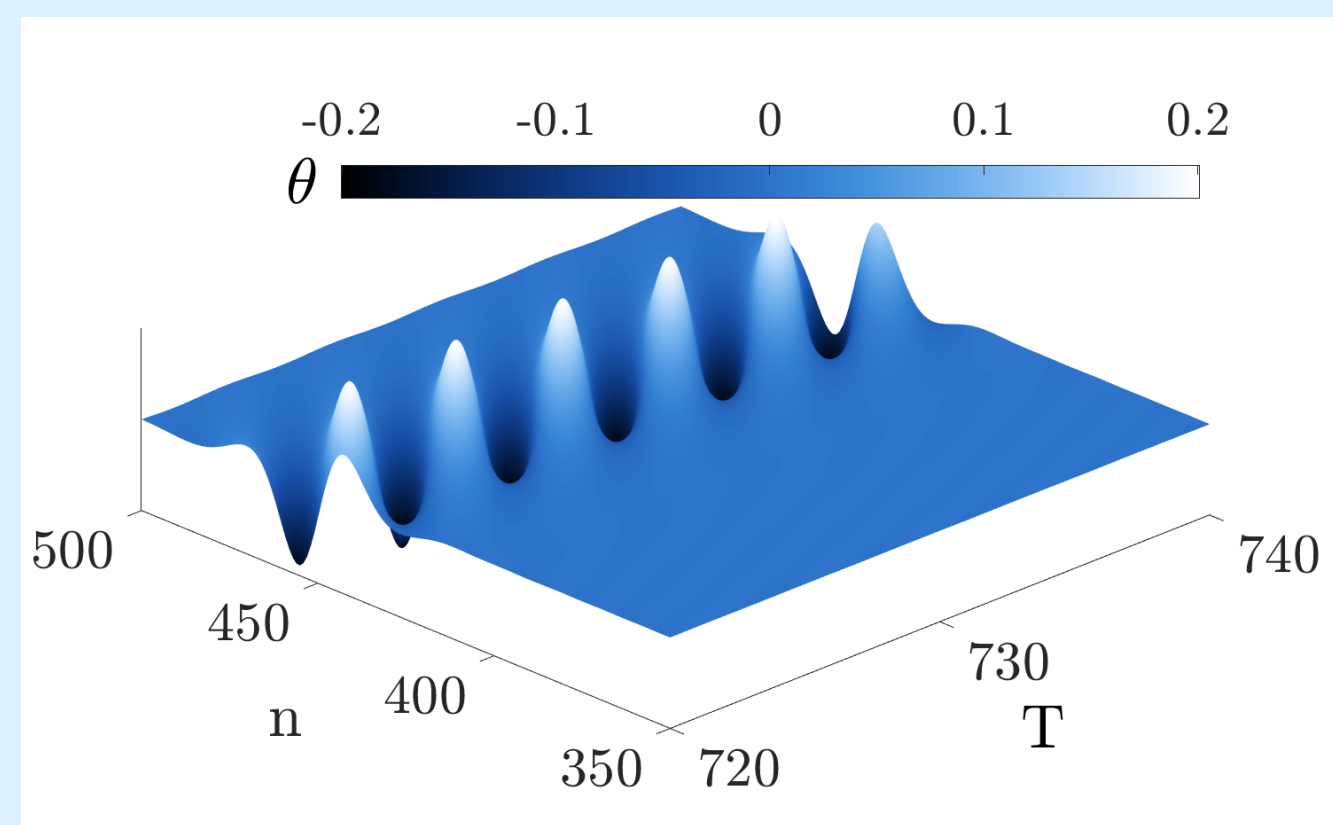
$$\theta_1 = F_1(X_1, T_1, X_2, T_2)e^{i(kX_0 - \omega T_0)} + F_1^*(X_1, T_1, X_2, T_2)e^{-i(kX_0 - \omega T_0)}$$

From the motion equations of the flexMM :

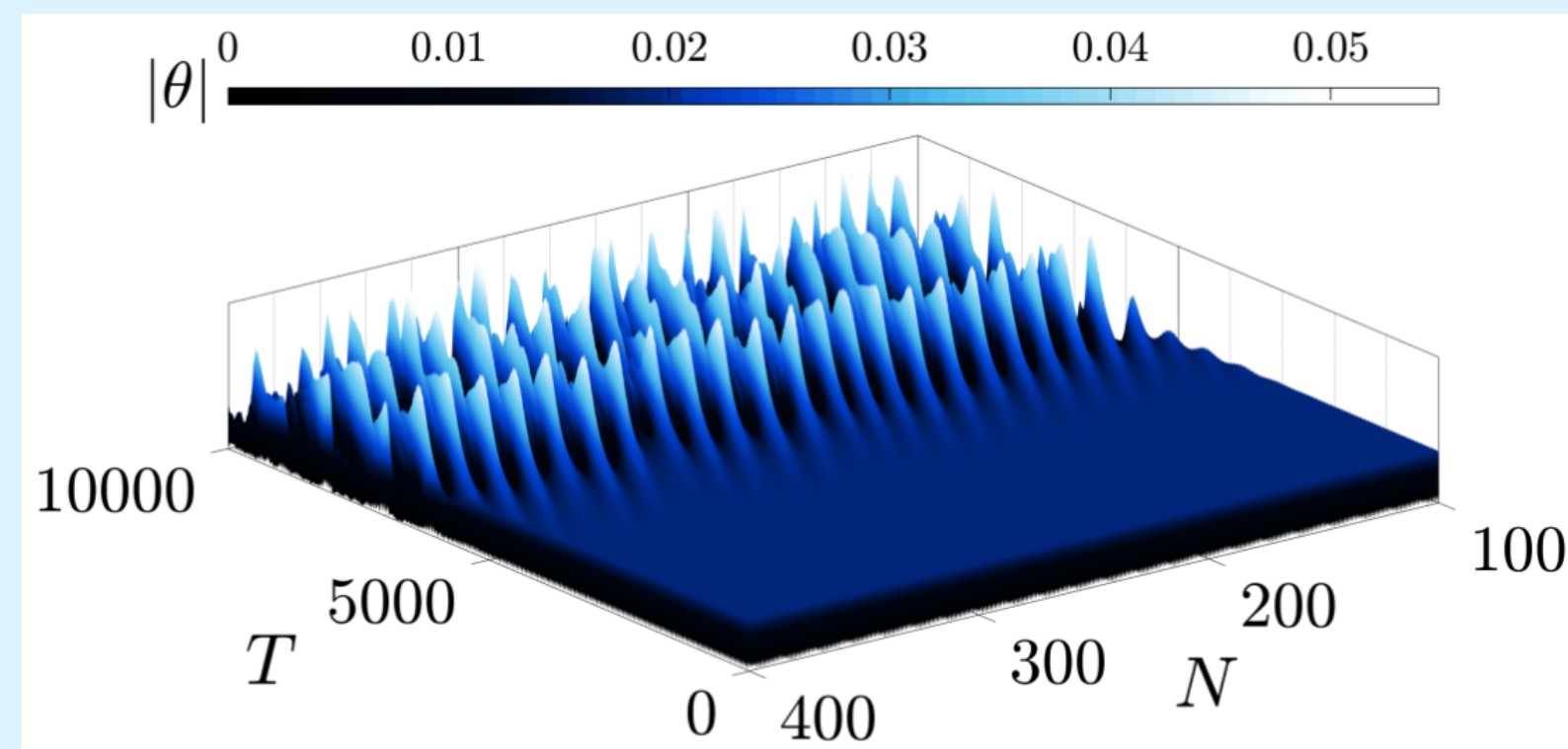
$F_1$  follows a nonlinear Schrödinger equation.



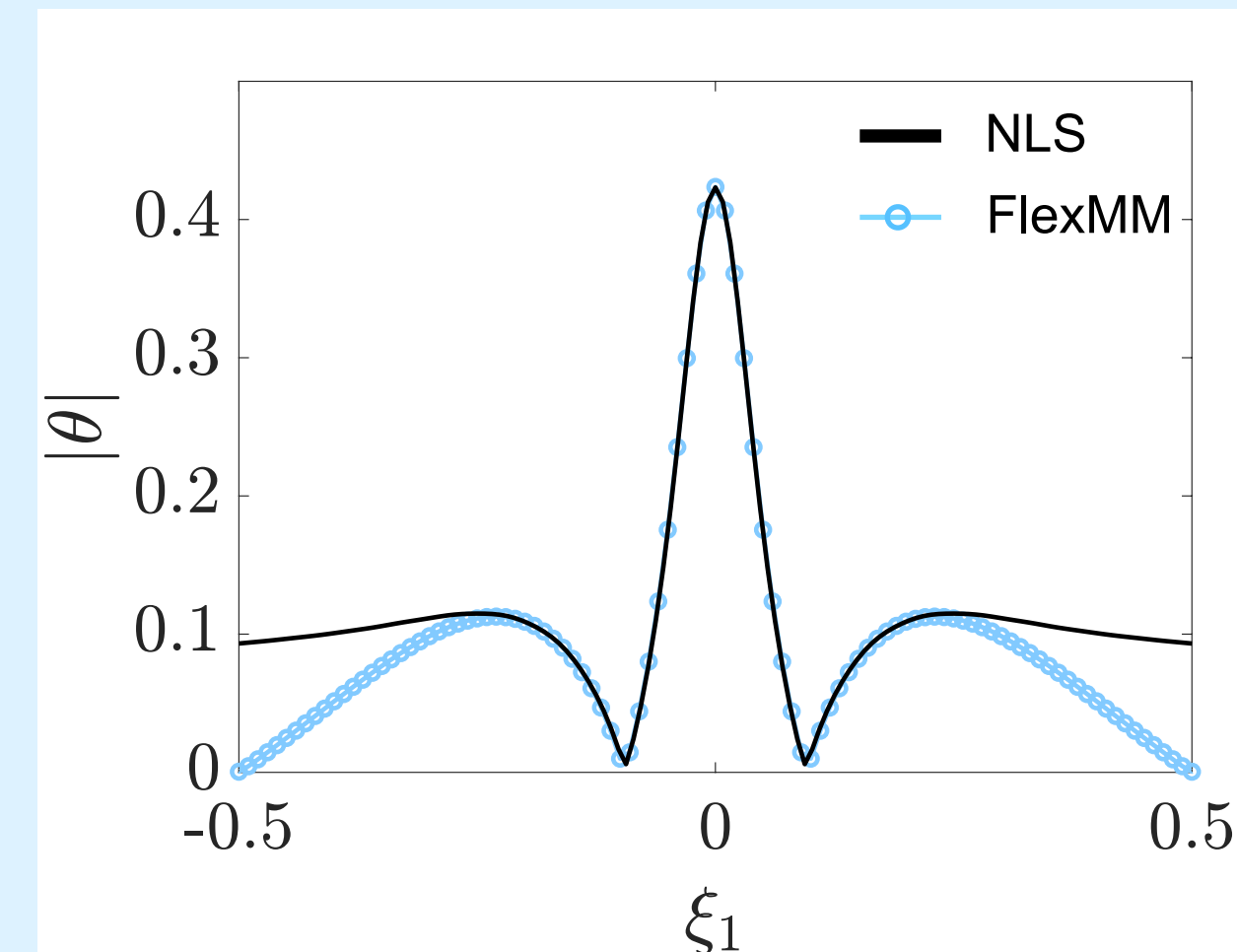
### Bright envelope vector soliton (BEVS)



### Modulation instability (MI)



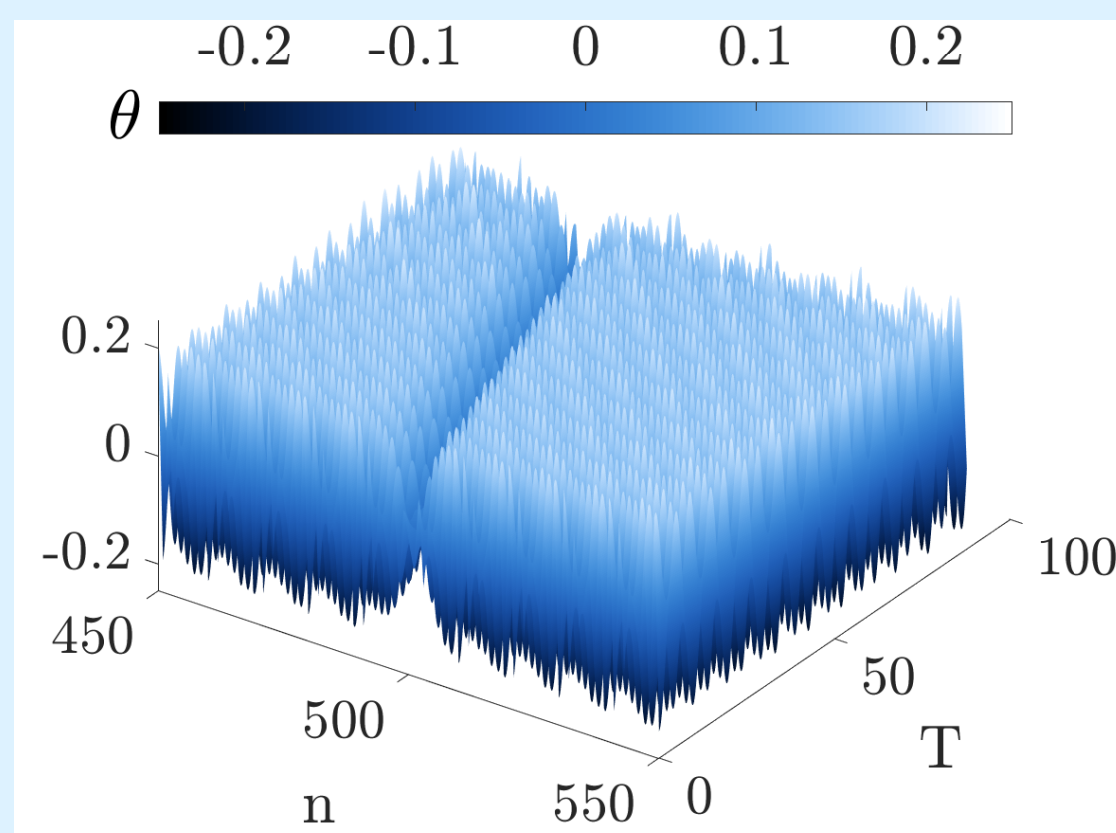
### Peregrine soliton



$$i \frac{\partial F_1}{\partial \tau_2} + P \frac{\partial^2 F_1}{\partial \xi_1^2} + Q |F_1|^2 F_1 = 0$$

Nonlinear Schrödinger equation (NLS)

### Dark envelope vector soliton (DEVS)



### Higher-order vector solitons

