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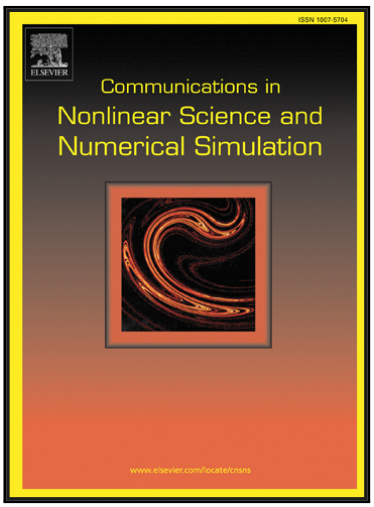

Families of fundamental and vortex solitons under competing cubic-quintic nonlinearity with complex potentials

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Highlights:

- It is found that solitons in 2D PT-symmetric lattices with competing nonlinearith will exhibit some bizarre behavior.
- It is found that vortex solitons with focusing cubic and defocusing quintic nonlinearity bifurcate from Bloch band, while vortex solitons with defocusing cubic and focusing quintic nonlinearity cannot bifurcate from Bloch band and the power curve move back near Bloch band. Two branches of vortex solitons with different intensity profiles are also found
- In PT symmetric lattices with competing nonlinearity, three cases are demonstrated to support fundamental solitons. Two cases are demonstrated to support vortex solitons. These cases are all set as competing focusing-defocusing nonlinearity.
- The competing nonlinearity is mainly focusing or defocusing, depending on the coefficient of nonlinear terms and the propagation constant. The stabilities of these solitons are analyzed by the VK criterion (for the focusing nonlinearity) or the anti-VK criterion(for the defocusing nonlinearity).

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