On Almost Cubic NLS equations: focusing vs. defocusing cases

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In this talk, I will review some of the work done jointly with C. Babaoglu, S. Erbay, H. Erbay, B. Gürel, G. Muslu, I. A. Topaloglu and E. Kuz on the generalized Davey-Stewartson equations in the purely elliptic case. I will cast these equations as a Nonlinear Schrödinger Equation (NLS) with cubic like non-local non-linearity in 2D and discuss some of the conserved quantities and their relation to the global existence of solutions; virial identity and its relation with blow-up of solutions; the pseudoconformal invariance and its relation with the time asymptotics of solutions. I will also review our recent joint work with E. Kuz and B. Gürel on the clear demarcation between the focusing and defocusing cases for these equations. In the focusing case, we prove that every initial value can be transformed to one with negative energy and thereby giving rise to a finite time blow-up. In the defocusing case, we have the scattering of solutions in various norms.