[1] A non periodic and asymptotically linear indefinite variational problem in $\mathbb{R}^N$

Liliane Maia (Universidade de Brasília), José Carlos de Oliveira Jr. (UnB), Ricardo Ruviaro (UnB)

Resumo/Abstract:
A nonlinear Schrödinger equation which models a light beam propagating in a saturable medium may present a sign changing potential in the linear term and lead to a semilinear elliptic equation in $\mathbb{R}^N$ with a potential that has a negative part, see [2]. We will present some recent results on the existence of nontrivial solution for

$$-\Delta u + V(x)u = f(u) \qquad in\ \mathbb{R}^N, \tag{P}$$

$N \geq 3$, with a non-periodic continuous potential V which may change sign, with an asymptotic limit V_∞ at infinity and a function f asymptotically linear at infinity.

We do not use projections on the Nehari manifold either apply the generalized Nehari method as in [1]. We apply the classical linking theorem with Cerami condition. This is possible by using the positive ground state solution u_0 of limit problem

$$-\Delta u + V_\infty u = f(u) \qquad in\ \ \mathbb{R}^N, \tag{P_∞}$$

projected on a infinite dimensional subspace of $H^1(\mathbb{R}^N)$ with finite codimension. Moreover, it is crucial to estimate the interactions of the translates of u_0 in order to obtain the linking geometry. Furthermore, the lack of compactness due to working with a problem in the unbounded domain $\mathbb{R}^N$ is circumvent by an assumption of a spectral gap of the operator $-\Delta + V$.

References

[1] A. A. Pankov, Periodic nonlinear Schrödinger equation with application to photonic crystals, *Milan J. Math.*, **73** (2005), 259–287.

[2] C. A. Stuart, Guidance properties of nonlinear planar waveguides, *Arch. Rational Mech. Anal.*, **125** (1993), 145–200.

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