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Near-BPS Skyrme Models for Nuclei

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We present our most recent results regarding Near-BPS Skyrmions and argue that they provide an improved description of nucleons and nuclei. For some years now, the Skyrme Model and extensions have been considered natural candidates for a low-energy effective theory of QCD, a point of view supported by results coming from $1/N$ expansion and holographic QCD. This framework leads to an attractive picture: baryons (and nuclei) emerge as topological solitons with a topological number identified to the baryon number. But the most naive Skyrme Model extensions have been plagued with the same problem: they predict large binding energies for the nuclei. On the other hand, the solutions that arise from the more recently proposed near-BPS Skyrme models nearly saturate the Bogomol'nyi bound which means that by construction there must have small binding energies. We address a number of issues related to the strength of each terms in the Lagrangian and the form of the potential of these models with their consequences on the baryon density configurations, Coulomb energies, isospin symmetry breaking, binding energies and mean radius of the nuclei, the pion mass and more.

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