Nuclear symmetry energy from microscopic calculations of the dipole response in finite nuclei

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In this contribution, we start by a brief review concerning the amount of general information on the nuclear equation of state (EOS) that has been deduced so far from giant resonances. This information can only be extracted by means of theory, the main tool being microscopic self-consistent mean field calculations.

We then focus on one of the most debated questions at present, namely the density dependence of the nuclear symmetry energy. We have investigated correlations between the parameters governing the symmetry energy, the neutron skins, and the properties of either the usual Giant Dipole Resonance in ^{208}Pb, or the Pygmy Dipole Resonance in ^{68}Ni and ^{132}Sn. These correlations are found within different Random Phase Approximation (RPA) models for the dipole response, based on both a representative set of Skyrme effective forces and also meson-exchange effective Lagrangians. We show that the comparison with the experimental data has allowed to constrain both the value of symmetry energy at density around 0.1 fm^{-3} and the derivative of the symmetry energy at saturation density.

We finally discuss the physical understanding behind these results, and we compare our constraints with the findings of quite different methods, involving the analysis of heavy-ion collisions and other nuclear properties.