

# Recent shell model investigations in medium mass nuclei from Ni56 to Sn132.

Kamila Sieja<sup>1</sup> and Frédéric Nowacki<sup>2</sup>

1. *Gesellschaft für Schwerionenforschung mbH., Planckstrasse 1, Darmstadt*
2. *Institut Pluridisciplinaire Hubert Curien, 23 rue du Loess, 67037  
Strasbourg Cedex*

In this work we present recent developments of the shell-model approach to describe a range of varied phenomena in medium mass region. An  $^{56}\text{Ni}$  inert core is considered and the effective interaction is derived from renormalized realistic nucleon-nucleon interaction with monopole corrections to ensure basic propagation of single particles states between  $^{56}\text{Ni}$  and  $^{132}\text{Sn}$ . We then discuss several applications: first, the description of isomeric states in mass  $A \sim 95$  region originating from deep proton holes and high neutron particle states. Then we show the progressive transition from spherical to deformed shapes in Zirconium isotopes and analyse this phenomenon in terms of the shell evolution driven by the proton-neutron monopole interaction and quadrupole correlations. Finally, we calculate and discuss  $\beta\beta$  decay nuclear matrix elements for  $^{96}\text{Zr}$  and  $^{100}\text{Mo}$  cases.