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What can we learn from large-scale MCSM calculations?

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I shall overview recent results from Monte Carlo Shell Model (MCSM) calculations. We are performing large-scale MCSM calculations in two ways. One of them is MCSM ab-initio calculations for light nuclei. The JISP16 and others Hamiltonians are taken, and the structure of light nuclei is studied including intrinsic density. Abe will discuss in detail on those results before this presentation. I then present a brief summary of them. In this talk, I will focus on usual MCSM calculations on heavier exotic nuclei, with particular interest to nuclear shapes. In our recent studies, we have shown that exotic Ni isotopes manifest various intriguing features. One of them is shape coexistence of spherical, oblate and prolate shapes at low excitation energies. The prolate band is nearly super deformed, and comes down as low as below 2 MeV. The appearance of this band is related the Type II Shell Evolution which is another visible consequence of the tensor force. This phenomena can be generalized to Dual Quantum Liquid picture. If time allows, Zr and other nuclei will be discussed. Recent MCSM calculation enables us to see shape fluctuations of various components of a given shell-model eigenstate. The pairing interaction produces fluctuations around the same shape, while the shape itself fluctuates to form eigenstates. Such dynamical fluctuation includes those seen in doubly magic 56,68,78Ni as well as gamma-soft nuclei.