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Current status of the no-core Monte Carlo shell model TAKASHI ABE, Department of Physics, the University of Tokyo, PIETER MARIS, Department of Physics and Astronomy, Iowa State University, TAKAHARU OTSUKA, Department of Physics, the University of Tokyo, NORITAKA SHIMIZU, Center for Nuclear Study, the University of Tokyo, YUTAKA UTSUNO, Advanced Science Research Center, Japan Atomic Energy Agency, JAMES VARY, Department of Physics and Astronomy, Iowa State University — One of the major challenges in nuclear physics is to describe nuclear structure and reactions from first principles. Such *ab initio* calculations have recently become feasible for nuclear many-body systems beyond $A = 4$ due to the development of quantum many-body methods along with the rapid evolution of computational technologies. The No-Core Shell Model (NCSM) is one of the relevant *ab initio* methods and is now available for the study of nuclear structure and reactions in the p-shell nuclei. As the NCSM treats all the nucleons on an equal footing, computational demands for the calculations explode exponentially as the number of nucleons increases. In order to access heavier nuclei, many efforts have been devoted to the NCSM calculations. Among them, the no-core Monte Carlo shell model (MCSM) is one of the promising candidates to go beyond the Full Configuration Interaction method. Here, we report recent developments of the MCSM and its application to the no-core calculations. No-Core Full Configuration results are also presented as full *ab initio* solutions extrapolated to the infinite basis limit. We compare the NCFC results with the MCSM results extrapolated to the infinite basis space.

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