Complex-Scaled CDCC method for nuclear breakup reactions
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Hokkaido Univ. — Nuclear breakup process is very important for light unstable nuclei (typically halo nuclei) induced reactions because of their weak-binding nature.
The continuum-discretized coupled-channel (CDCC) method is known to be one of
the powerful method to describe the nuclear breakup reaction. Indeed, CDCC has
been applied to a number of analyses for the breakup reactions of both the stable and
unstable nuclei, and the successful results have been obtained. In the present study,
we propose complex-scaled CDCC (CS-CDCC) method, in which only the internal coordinate and momentum of the projectile are complex-scaled. The expected
advantages of CS-CDCC are (1) in spite of the discretization, we can obtain the
continuous S matrix elements without the smoothing function, because the continuum level density is correctly obtained, (2) in the framework of the complex scaling
method, three-body scattering state can be solved properly, (3) the resonance state
is strictly separated from the continuum states, and this fact is more advantageous
for investigation of reaction mechanism than the ordinary CDCC method. We apply
CS-CDCC to the $d \rightarrow p + n$ breakup reaction on a ^{58}Ni target at E_d=80 MeV to
confirm the availability of CS-CDCC. We also plan to apply it to breakup reactions
of light unstable nuclei.

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