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Reaction Rate Uncertainties using R-matrix: 3He(a,g) and 12C(a,g)[1] RICHARD DEBOER, JOACHIM GOERRES, KARL SMITH, ETHAN UBERSEDER, MICHAEL WIESCHER, University of Notre Dame, GIANLUCA IMBRIANI, INFN, ANTONIOS KONTOS, Michigan State University — Many of the reaction rates involving light nuclei in the *pp* chains and the CNO cycles are heavily influenced by short lived nuclear states. These states manifest as broad resonance structures observed in the cross sections of low energy reaction data. Because of the Coulomb repulsion between the two charged particles, the low energy cross section is often too small to be measure directly in the laboratory. For this reason, experimental measurements are made at higher energies, and then extrapolated down to the energy region of astrophysical interest. The energy dependence of the experimentally measured cross sections may be described using R-matrix theory. While R-matrix theory has proved to be quite successful, it is often difficult to extract uncertainties from the mathematically complicated framework. To illustrate these points, R-matrix analysis for the reactions ^{3}He$(\alpha,\gamma)^{7}$Be and ^{12}C$(\alpha,\gamma)^{16}$O will be described. A Monte Carlo uncertainty analysis is performed in order to extract statistically meaningful uncertainties. To find the total rate uncertainty, the R-matrix MC analysis can be combined with an MC analysis for the narrow resonance contributions using, for example, the Starlib code RatesMC.

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