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New cross section for reaction of $O^+(^4S)$ with N_2 RAINER JOHNSEN, Univ of Pittsburgh, LARRY VIEHLAND, Chatham University — Rate coefficients of the ionospheric reaction O^+ (^4S) + N_2 $\rightarrow NO^+$ +N that were measured 40 years ago by the flow-drift [1] method are still used in ionospheric models. The reaction depends strongly on energy which makes it sensitive to the ion velocity distribution. The NOAA flow-drift data (using both helium and argon as buffer gases) were analyzed using then available interaction potentials and analytical and Monte Carlo solutions of the Boltzmann equation. More accurate ab initio potentials are now available and new approaches to deriving velocity distributions have been developed, such as the Gram Charlier method that computes the higher moments of the distribution functions (skewness, kurtosis, and correlations between the parallel and perpendicular velocity components). We have carried out extensive computations of O^+ ion velocity distributions in both helium and argon, based on the Gram Charlier method and ab initio interaction potentials. We then applied the results to the O^+ + N_2 reaction rate data. We found that the experimental data can only be reproduced if the reaction cross section is substantially changed from that in the original paper of the NOAA group. As a consequence, effective rate coefficients appropriate to the temperatures and velocity distributions in the ionosphere need to be reevaluated. [1]D. L. Albritton et al J. Chem. Phys. **66**, 410 (1977).

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