Supplement of Atmos. Chem. Phys., 16, 3449–3462, 2016
http://www.atmos-chem-phys.net/16/3449/2016/
doi:10.5194/acp-16-3449-2016-supplement

Atmospheric Chemistry and Physics Open Access EGU

Supplement of

Charging and coagulation of radioactive and nonradioactive particles in the atmosphere

Yong-ha Kim et al.

Correspondence to: Costas Tsouris (tsourisc@ornl.gov)

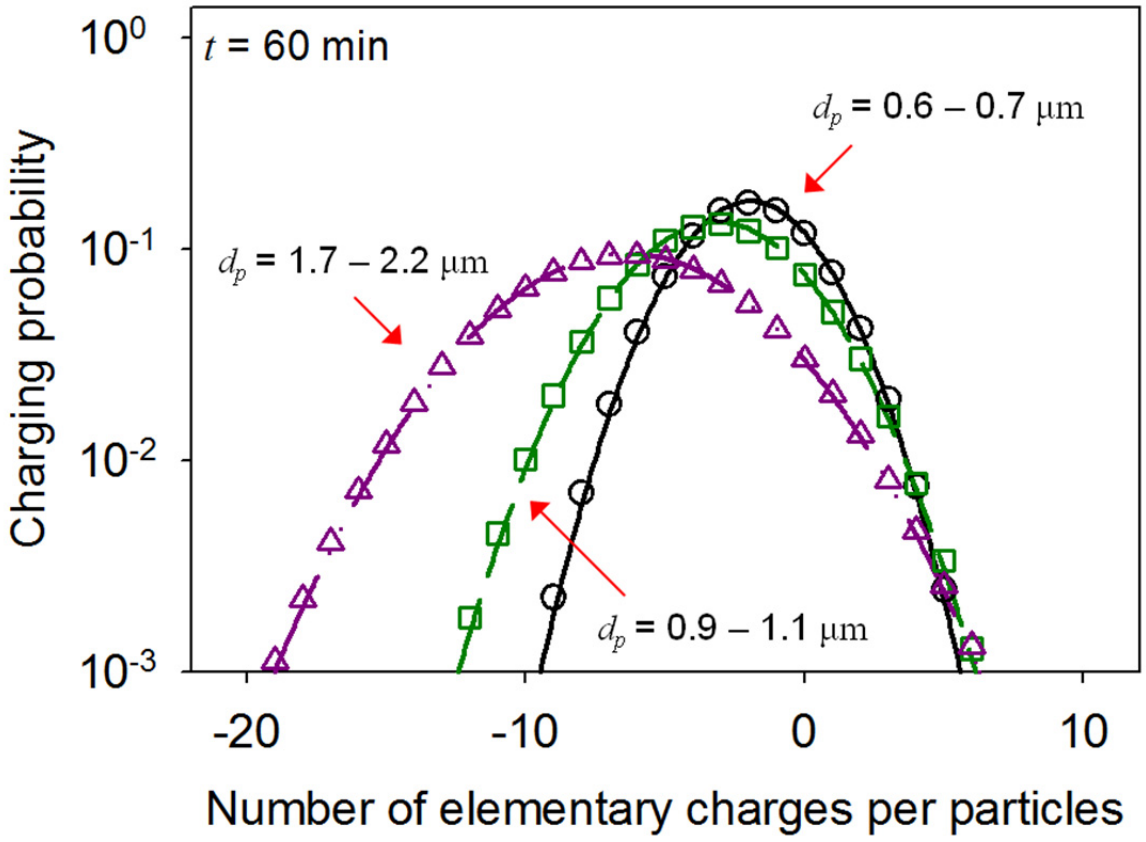

Figure S1. Charge distributions of particles undergoing coagulation under a monodispersed initial condition (d_p = 0.5 μm, $N_t = 10^{13}$ cm^{-3}; $n_{\text{ion}}^0 = 10^{16}$ m^{-3}). The charging probability was obtained according to Renard et al.(2013). The lines and symbols represent the simulation results of Approaches 1 and 2, respectively. Three size bins are chosen to compare the simulation results of the approaches.

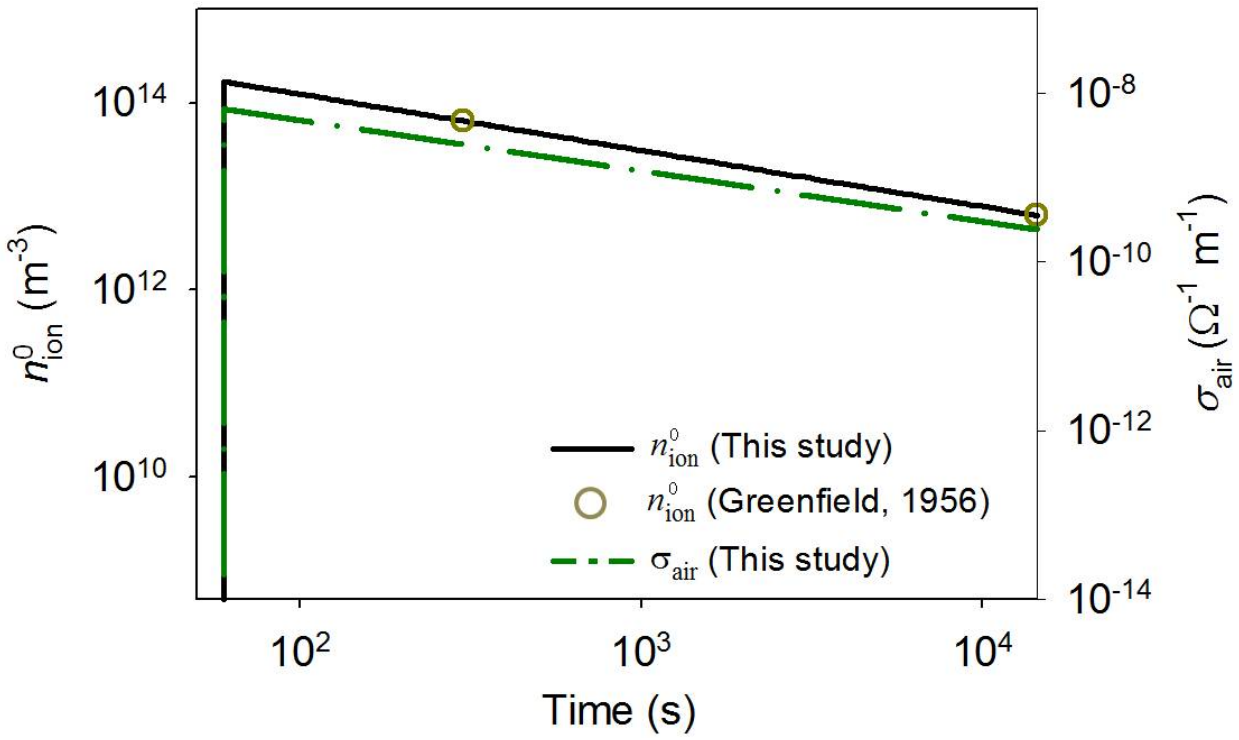

Figure S2. Time-evolution of the mean ion concentration, n^0_{ion} and air conductivity σ_{air} induced by monodispersed radioactive particles at 6 km altitude (d_p = 0.1 μm, $N_t = 3.55\times10^{10}$ m^{-3}; $I = 1.5\times10^4$ s^{-1}). The lines represent the simulation results of Approach 1. The symbols represent the estimation of Greenfield (1956).

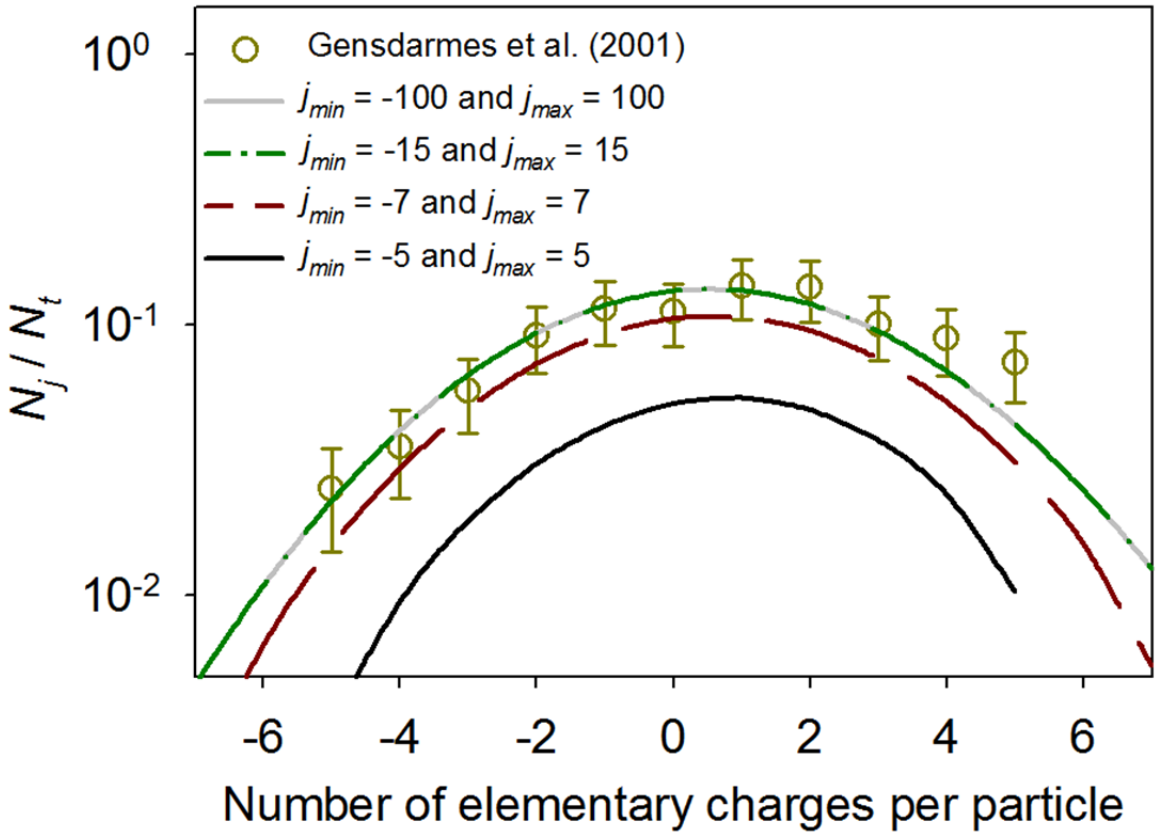

Figure S3. The charge distributions of monodispersed ^{137}Cs particles predicted under various boundary conditions (d_p = 0.82 μm, $A_{Cs\text{-}137}$ = 12.8 mBq, and $q_I = 7.1\times10^6$ m^{-3} s^{-1}). j_{min} and j_{max} represent the minimum and maximum values for particle charge classes.

REFERENCES

Gensdarmes, F., Boulaud, D., and Renoux, A.: Electrical charging of radioactive aerosols–comparison of the Clement-Harrison models with new experiments, J. Aerosol Sci. 32, 1437-1458, doi:10.1016/S0021-8502(01)00065-9, 2001.

Greenfield, S. M.: Ionization of radioactive particles in the free air, J. Geophys. Res., 61, 27-33, doi:10.1029/JZ061i001p00027, 1956.

Renard, J.-B., Tripathi, S. N., Michael, M., Rawal, A., Berthet, G., Fullekrug, M., Harrison, R. G., Robert, C., Tagger, M., and Gaubicher, B.: In situ detection of electrified aerosols in the upper troposphere and stratosphere, Atmos. Chem. Phys., 13, 11187–11194, doi:10.5194/acp-13-11187-2013, 2013.