Numerical study on lightning frequency in a tropical cyclone

*佐藤 陽祐[1,3]、宮本 佳明[2,3]、富田 浩文[3]
*Yousuke Sato[1,3], Yoshiaki Miyamoto[2,3], Tomita Hirofumi[3]

1. 名古屋大学工学研究科、2. 慶應大学環境情報学部、3. 理化学研究所計算科学研究センター
1. Department of Applied Energy, Nagoya University, 2. Faculty of Environment and Information Studies, Keio University, 3. RIKEN Center for Computational Science

This study investigates frequency of lightning in each stage of lifecycle of tropical cyclone (TC) using the next generation weather and climate library called Scalable Computing for Advanced Library and Environment (SCALE; Sato et al. 2015, Nishizawa et al. 2015). Lightning component was developed and implemented into SCALE in this study. An idealized experiment based on an experimental setup of Miyamoto and Takemi (2013) was conducted by SCALE coupled with lightning component. The results of the simulation indicate that the lightning frequency is maximum before rapid intensification (RI) of TC, which supports the report of Price et al. (2009) derived from satellite observation. The frequency of lightning decreases after RI and it keeps small until the TC reaches steady state. Our analyses elucidate that the dependency of the lightning frequency upon the developing stage of TC is originated from the type of convection dominating at each growth stage. Before the RI, the convection generated by consuming convective available potential energy (CAPE) transport hydrometeors upward, and the charge split and the lightning frequently occur. During the steady state, the hydrometeors are mainly transported by the fast rotating flow in the simulated TC, which resulted in the weak charge split and small frequency of lightning.

キーワード：台風、雷
Keywords: Tropical cyclone, Lightning