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Influence of the Canton Tower on Lightning Flashes in its Vicinity using Optical Observation Data

Authors

Prof. Weitao Lyu - Chinese Academy of Meteorological Sciences

Ms. Ruijiao Jiang - Chinese Academy of Meteorological Sciences

Dr. Lyuwen Chen - Institute of Tropical and Marine Meteorology, China
Meteorological Administration, Guangzhou

Ms. Shanshan Wu - Chinese Academy of Meteorological Sciences

Mr. Qi Qi - Chinese Academy of Meteorological Sciences

Ms. Ying Ma - Chinese Academy of Meteorological Sciences

Dr. Bin Wu - Chinese Academy of Meteorological Sciences

Prof. Wen Yao - Chinese Academy of Meteorological Sciences

Ms. Changxiu Zhang - State Key Laboratory of Safety and Control for Chemicals,
SINOPEC Research Institute of Safety Engineering, Qingdao

Abstract

A field experiment, mainly focusing on the observation of lightning flashes terminating on tall structures, has been conducted since 2009 at the Tall-Object Lightning Observatory in Guangzhou (TOLOG), Guangdong province, China. Hundreds of lightning flashes have been captured at TOLOG using optical instruments (high-speed video camera, lightning channel imager, etc.). In the northwest 60° sector region of the Canton Tower (CT, 600 m high) within 3 km, the locations of 119 downward lightning flashes during 2009-2014 and 214 lightning flashes (approximately 100 upward) during 2015-2017 could be determined. Most of the upward lightning flashes were initiated from CT, the tallest object in Guangzhou City. These upward flashes can be triggered by the return stroke, the continuing current, or the discharging process in the cloud of positive cloud-to-ground lightning. Among the downward lightning flashes, approximately 20% hit CT and no other downward lightning was observed within 1 km distance from CT. CT had an impact on the density distribution of lightning in its vicinity. The relative density of the flashes (excluding flashes hitting objects with heights of more than 300 m) increases with the increase of distance from CT. The optical observation data obtained at TOLOG indicated that the attraction effect of tall-object on the downward lightning flashes gradually weakens with the increase of distance from the tall-object.

Topic Areas

Lightning Physics, Characteristics and Measurements, Tower-Initiated and Rocket Triggered Lightning

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