

Development of electric field mill kit for multiple measurement of thunderstorm electrification.

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In the recent, a lot of advances have been made in the regions to monitor thunderstorm activity, as related to nowcast of severe weather, such as heavy rainfall, downburst and so on. Observation of charge and discharge for thundercloud is one of the most efficient ways to evaluate thunderstorm activity. There are remarkable progresses in the observation of lightning discharge. In an advanced lightning observation, not only cloud-to-ground (CG) lightning discharge whose radiation is strong and easily detected but also intracloud (IC) lightning discharge which is not easily monitored due to weak radiation can be monitored. Previous studies indicated that IC detection was a key technology for nowcast of severe weather. Monitoring of thunderstorm electrification based on electrostatic measurement is also focused on as an effective method. Preceding observation indicated that charge of thundercloud can be detected before IC/CG occurrence. However, preceding studies also pointed that not only thundercloud but also charges nearby instruments could be detected due to high sensitivity. Although electrostatic measurement would be effective for nowcast of severe weather, especially for lightning discharge, it remains at the research stage due to difficulty of operation.

In this study, we plan to construct operational thunderstorm observation network based on multiple electrostatic measurement and have newly developed simple and low-cost electric field mill (EFM) kit. EFM kit consists of mechanical part and electrical circuit one. Mechanical part is manufactured to convert DC electrostatic field to AC signal. Electrical circuit part is designed to amplify the signal and recognize direction (downward or upward) of electrostatic field. In this presentation, the details of EFM kit and results of test observation in Japan is reported. Additionally, plan of EFM deployment is summarized. This work was supported by JSPS KAKENHI Grant Number 15K16314 and by Japan International Cooperation Agency (JICA) and JST under SATREPS.

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