

## Multi-color photometric observation of cloud-to-ground and intra-cloud lightning from space

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This study aims at evaluating the effectiveness of spectrophotometric measurement from space in characterizing the properties of lightning flash. The multicolor photometric data obtained by FORMOSAT-2/ISUAL were analyzed in both of cloud-to-ground (CG) and intra-cloud (IC) lightning events identified by Duke RF measurement, National Lightning Detection Network (NLDN), North Alabama Lightning Mapping Array (LMA). The ISUAL data suggested that, while the optical color of CG strokes tends to be red, the color of IC pulses tends to be unchanged or blue. These tendencies were found consistently in about 90 % of 51 lightning events analyzed so far. Furthermore, in one event which was simultaneously observed by ISUAL and LMA, the color of lightning was found to slowly change to red as the source altitude gradually decreased. These results consistently suggest that the color of CG component is more red than that of IC component, and we explain this as a result of more effective Rayleigh scattering in blue light emission coming from lower-altitude light source. This finding suggests that spaceborne spectral measurement could be a new useful technique to for the first time discriminate CG and IC flashes on a global level.

Keywords: Atmospheric electricity, Lightning, Satellite measurement, Spectral observation