

Forecasting thunderstorms for global sprite observations from the ISS

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The global rate of sprites occurring in the mesosphere following positive cloud-to-ground lightning flashes was estimated from the ISUAL satellite data to be ~0.5 per minute (Chen et al., 2008). During the summer 2011, in the framework of the "Cosmic Shore" project, we conducted a concentrated attempt to image sprites from the ISS, by directing the astronaut on-board. The methodology for target selection was based on that developed for the space shuttle MEIDEX sprite during the Columbia mission STS-107 (Ziv et al., 2004). Different types of convective systems generate thunderstorms which differ in their effectiveness for sprite production (Lyons et al., 2009); thus, we had to evaluate the ability of the predicted storms to produce sprites. We used the Aviation Weather Center (<http://aviationweather.gov>) daily significant weather forecast maps (SIGWX) to select regions with high probability for convective storms and lightning such that they were within the camera field-of-view as deduced from the ISS trajectory and distance to the limb. In order to enhance the chance for success, only storms with predicted "Frequent Cb" and cloud tops above 45 Kft (~14 km) were selected. Additionally, we targeted tropical storms and hurricanes over the oceans. The accuracy of the forecast method enabled obtaining the first-ever HDTV color images of sprites from space. We will report the observations showing various types of sprites in many different geographical locations, and correlated parent lightning properties derived from ELF and global and local lightning location networks (WWLLN).

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Keywords: Thunderstorms, Forecast, Sprites, ISS, Lightning, TLE