A04-08 New estimation of nitrogen oxides produced by lightning based on the new Lightning Imager onboard the Meteosat Third Generation Satellite

iPoster Gallery (Online)

Monday, 9 December 2024 : 08:30 - 17:30

Tuesday, 10 December 2024 : 08:00 - 17:30

Wednesday, 11 December 2024 : 08:00 - 17:30

Thursday, 12 December 2024 : 08:00 - 17:30

Friday, 13 December 2024 : 08:00 - 17:30

Abstract

The Lightning Imager (LI) onboard the Meteosat Third Generation (MTG) was successfully launched in December 2022. The LI is composed of four cameras centered on the atomic oxygen line at 777 nm, covering Europe, Africa, the Middle East, and parts of South America. Lightning optical measurements, available since July 2024, are composed of light pulses. These light pulses are clustered into groups and flashes, with information about the energy of the pulses, duration, and footprint provided.

In this study, we present a preliminary estimation of nitrogen oxides produced by lightning (LNO_X) in the Iberian Peninsula. The estimations of LNO_X are based on the novel combination of lightning measurements provided by MTG-LI and the Ebro Lightning Mapping Array (eLMA), together with NO_2 and cloud data provided by the TROPOspheric Monitoring Instrument (TROPOMI). Atmospheric chemistry simulations based on the Weather Research & Forecasting Model (WRF) are used to estimate the total column density of LNO_X from the slant column density of NO_2 provided by TROPOMI.

Previous studies have suggested a possible relationship between the optical characteristics of lightning in America and LNO_X. In particular, a positive relationship between flash multiplicity and optical energy with LNO_X per flash was reported by Allen et al. (2021a, 2021b) [1,2]. In turn, recent lightning measurements provided by LMA and LNO_X estimates suggest positive relationship between flash channel lengths and LNO_X per flash [3]. In this study, we explore new relationships between LNO_X and the characteristics of lightning provided by MTG-LI and eLMA.

[1]: Allen, D., et al. (2021a). Observations of lightning NO_X production from Tropospheric Monitoring Instrument case studies over the United States. Journal of Geophysical Research: Atmospheres, 126(10), e2020JD034174.

[2]:Allen, D. e tal. (2021b). Observations of lightning NO_X production from GOES-R post launch test field campaign flights. Journal of Geophysical Research: Atmospheres, 126(8), e2020JD033769.

[3]: Pérez-Invernón, F. J., et al. (2023). Lightning-Produced Nitrogen Oxides Per Flash Length Obtained by Using TROPOMI Observations and the Ebro Lightning Mapping Array. Geophysical Research Letters, 50(24), e2023GL104699.