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Impacts of solar events on atmospheric density variations as revealed by Satellite Laser Ranging orbits.

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This paper is focused on precise orbitography with SLR data, using as well when they are available accelerometric data, as in the GRACE mission. The main purpose of this paper is to analyse whether low SLR satellite orbits (namely Starlette, Stella, Lares, Ajisai) are sensitive or not to variations of the atmospheric density due to solar events over the period 2003-2019, and including the ones that occurred in 2017.

The relationships between solar events and the way they modify the density of the Earth's thermosphere, as revealed by perturbations induced on artificial satellites orbits, are in fact of crucial importance for satellite operators. A wide literature focused on these issues already exists, but it appears to the authors that some improvements of thermosphere models are still expected, especially at high latitudes. This paper aims, hence, at contributing to fill a gap in that direction.

We first select over the period 1984-2019 a list of solar events that may be representative of the conditions that may heat the terrestrial atmosphere, in terms of geometrical configurations and the intensity of solar activity. The goal is to identify whether these events have impacted or not the thermospheric density at some relevant altitudes; therefore, a post-fit residual analysis is provided, accounting for the whole set of tracking data acquired by the stations of the ILRS network. A comprehensive comparison between precise results obtained with SLR and accelerometric data, using different atmospheric drag modelling, is then provided.