**Atmospheric drag force on LAPAN-TUBSAT satellite during geomagnetic storm 2015**

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ABSTRACT

The purpose of this research is determine the relation between LAPAN-TUBSAT orbital elements with solar activity and geomagnetic activity, estimate daily drag acceleration of LAPAN-TUBSAT, determine the relation between drag acceleration with solar activity and geomagnetic activity. Author uses STK (System Tool Kit) software, python, and CCMC (Community Coordinated Modeling Center) interactive model to process the data. To calculate the drag acceleration, it takes data of satellite’s velocity that obtained from STK and atmospheric density. To generate atmospheric density, author uses CCMC with MSISE-90 (Mass Spectrometer – Incoherent Scatter Extended 1990) and IRI (International Reference Ionosphere) atmospheric model. In addition, it takes satellite’s position (latitude, longitude, and height – taken from STK) as input.

On March 2015, solar activity was at moderate level (100 ≤ F10,7 ≤ 150) and geomagnetic storm index (daily Dst) had minimum value of -105 nT on March 18, 2015. According to daily Dst data, the minimum value of Dst reached -223 nT on March 17, 2015. Change of orbital elements were influenced more by geomagnetic storms through Dst index, compared by flux through F10,7 index. Maximum change of semi-major axis, inclination, argument of perigee, longitude of ascending node, and true anomaly occur on March 17-21, 2015 (storm period, Dst reached minimum value). Minimum change of eccentricity occurs on March 15-16, 2015 when Dst reached maximum value. Atmospheric model is quite sensitive to solar conditions, both during periods of calm or during periods of storm. Atmospheric density generated by MSISE-90 and IRI, both of them have 10-6 order difference. MSISE-90 is 10-16 while IRI 10-22. For MSISE-90, maximum drag acceleration reaches 451,4416 m/hari2 occur on March 17, 2015 along with strong geomagnetic storm phenomenon. For IRI, the value of drag acceleration during peak geomagnetic storm (March 18, 2015) reaches 0,000373 m/hari2 (close to the minimum value in March 2015). Drag acceleration of LAPAN-TUBSAT is linear to F10,7 index and Dst index. Both of them have correlation coefficient of 0,47 and -0,51.

*Keywords: drag; satellite; orbital element; atmosphere; geomagnetic storm*