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CONSIDERATIONS ON THE LISTS OF THE TOP 50 DEBRIS REMOVAL TARGETS

Abstract

Since the number of debris is expected to increase even with good compliance of debris mitigation measures in the future, active debris removal (ADR) is considered to be effective for ensuring sustainable space development. JAXA has been studying ADR targets using the Near-Earth Orbital Debris Environment Evolutionary Model (NEODEEM) jointly developed by Kyushu University and JAXA. Last year, McKnight et al. studied the Top 50 debris removal targets by combining each top 50 lists by eleven international teams[1], and JAXA participated in the study by submitting the top 50 objects with the highest expected number of fragments to be generated by collisions in the initial time period calculated in NEODEEM. However, in reality it is impossible to remove 50 pieces of debris at once, and if we remove only a few pieces each year, the debris to be removed will change. In addition, the ranking order also changes over time, and the priority of objects to be removed will change depending on future launches and collisions. In this paper, how ADR targets changes depending on such conditions will be shown. Next, the effect of ADR by various indices proposed in [1] will be discussed. The future evolutions of number of debris when each top 50 objects are removed will be compared using NEODEEM. Some of the indices proposed in [1] put priority on the long term stability, while some other indices on short term space safety. Not only the long term stability, but also the collision probability and number of conjunctions in short term are discussed.

[1] D. McKnight, et al., "Identifying the 50 Statistically Most Concerning Derelict Objects in LEO", IAC-20-A6.2.1, 2020. or Volume 181, Pages 282-291, Acta Astronautica, 2021.