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TOWARDS A NEW SPACE DEBRIS POPULATION UPDATE FOR ESA'S MASTER MODEL

Abstract

This paper will discuss the currently ongoing efforts regarding ESA's MASTER model and will give an outlook on what the space debris community can expect in the future. To develop a single unified set of software tools and procedures in view of ESA's requirements and international regulation when it comes to space debris mitigation, a new project line, the *Debris Mitigation Facility (DMF)*, has been established. The *DMF* is based largely on industrialised activities with internal support. A split is made between higher TRL implementation activities (industrial), prototyping (internal and in various ESA programmes), and maintenance (internal). In this paper, the ESA internal project "MASTER Population Pipeline" will be described and important features for the space debris community are highlighted.

This activity is part of the maintenance category and aims at establishing an automated processing chain that allows to create updated MASTER reference populations more frequently, i.e. with approximately annual release cycles. The rapid follow-up of the situation in orbit was a clear message coming from the MASTER workshop in March 2021 to do so. In addition, the current processing framework will be completely rewritten and integrated into ESA's infrastructure that centers around ESA's Database and Information System Characterising Objects in Space (DISCOS). The paper will give an overview of the current processing framework and the planned improvements. After a statistical overview of the current MASTER reference population (Nov 1, 2016), the processing steps to create the population are outlined. This contains the generation of the historic population part up to the reference population, its validation and the projection into the future. Examples like Starlink and OneWeb will showcase how these constellations are modelled in the future population. Following the description of the model itself, the population release procedure of the previous MASTER versions will be explained. Based on this, the envisaged population release cycle will be outlined and the apparent challenges to overcome will be presented.

In one of the last sections of the paper, we will provide insight into the current MASTER Roadmap, highlighting the prioritised features and on-going developments in the field. As a closing section and in context of modelling the MASTER population, we will present the latest analyses of the Russian Anti-Satellite Test on November 15, 2021.