



SHARE MY SPACE

Space debris recycling and management

INDEMN 1.0

INtelligent DEbris MaNagement

Long-term risk prediction software for space debris collision based on statistical models.

The program was made to help satellite operators to take into account the risk related to on-orbit space debris collision when planning the missions of their satellites.

The distribution of space objects at a given date is provided as an input. Several databases are included in the program such as the US Air Force space-track data bases and the NASA NSSDCA catalogue. All the space situation scenarios - such as mega-constellation deployment - can be implemented as an input to the code.

The density of space debris is computed for various altitudes and a statistical model is able to compute the evolution of the probability of collision for a given spacecraft in time.

The simulation tool was validated with ESA's finest Monte-Carlo codes and it has the great advantage to run at very low computational cost, so that many different scenarios can be easily tested.

Code characteristics	
Simulated time	2 month to 50 years
Number of objects by default	> 16 000
Accuracy in altitude	20 km
Range of altitude	200 - 2000 km (LEO)
Collision uncertainty	< 5% per year
Coding language	Python

INDEMN 1.0 features a library for input and output visualization.

The statistical model includes:

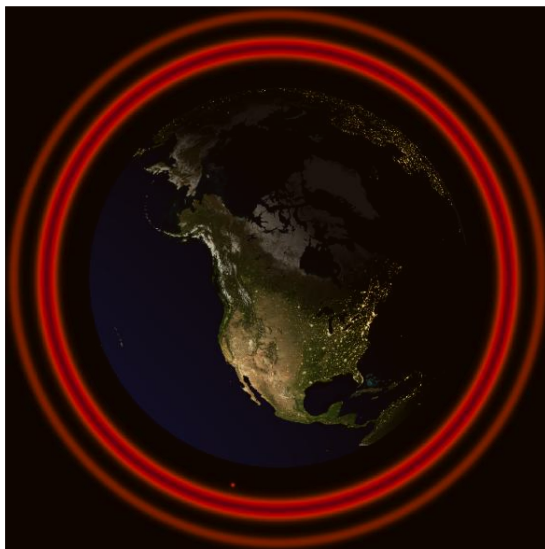
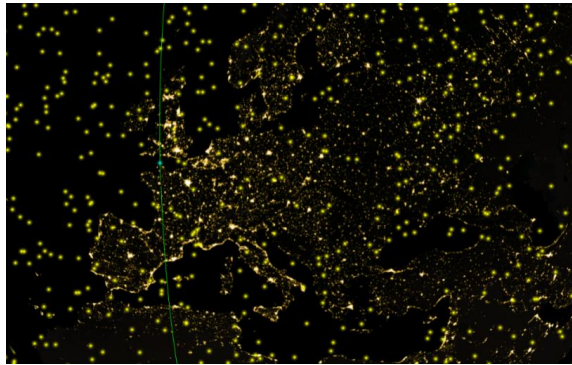
Source terms for the **generation of space debris:**

- ✓ On-orbit collisions
- ✓ Pressure tank explosions
- ✓ System failures

And **mitigation terms:**

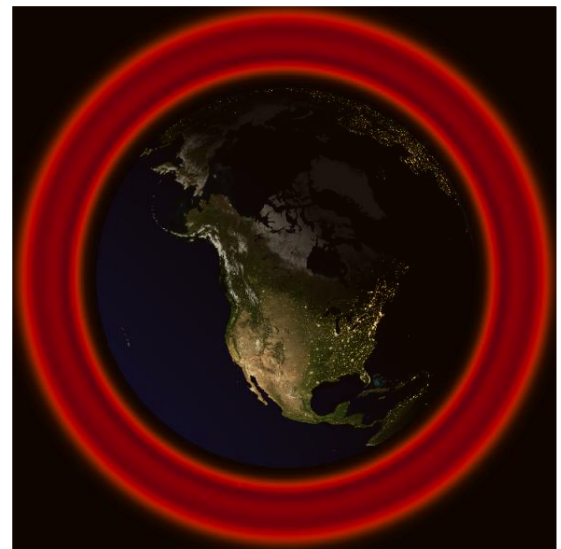
- ✓ Atmospheric drag
- ✓ Atmospheric re-entry

Space situation data loading



Density projection

→
X years



Model computation



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