KEYNOTE

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LECTURES



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Lecture #9



13:00 CET



THE SPACE DEBRIS ENVIRONMENT

At low earth orbits (LEO), particularly high collision velocities can occur. The potential risk of space debris is associated with the high kinetic energy that can occur during a collision. The collision velocities on LEO are in the order of ten kilometres per second. A risk for active spacecraft exists from a particle diameter of about one millimeter. Above this size, a satellite structure can be seriously damaged. Objects larger than about one centimetre pose a particular risk. Such objects can cause the loss of a satellite mission. They penetrate any satellite structure, even if it is protected by multiple walls. Satellites cannot be protected against the impact of objects larger than about one centimetre.

Currently there are about 900,000 artificial objects larger than one centimeter on all Earth orbits. The number of objects larger than one millimeter is estimated at about 130 million. The number of objects in the submillimeter range is several trillion. Objects with a particular risk are those between one and ten centimeters in diameter. They are too small for being tracked and too large for protective measures.

This lecture gives a general overview about the latest modeling results and the current knowledge about the space debris environment.

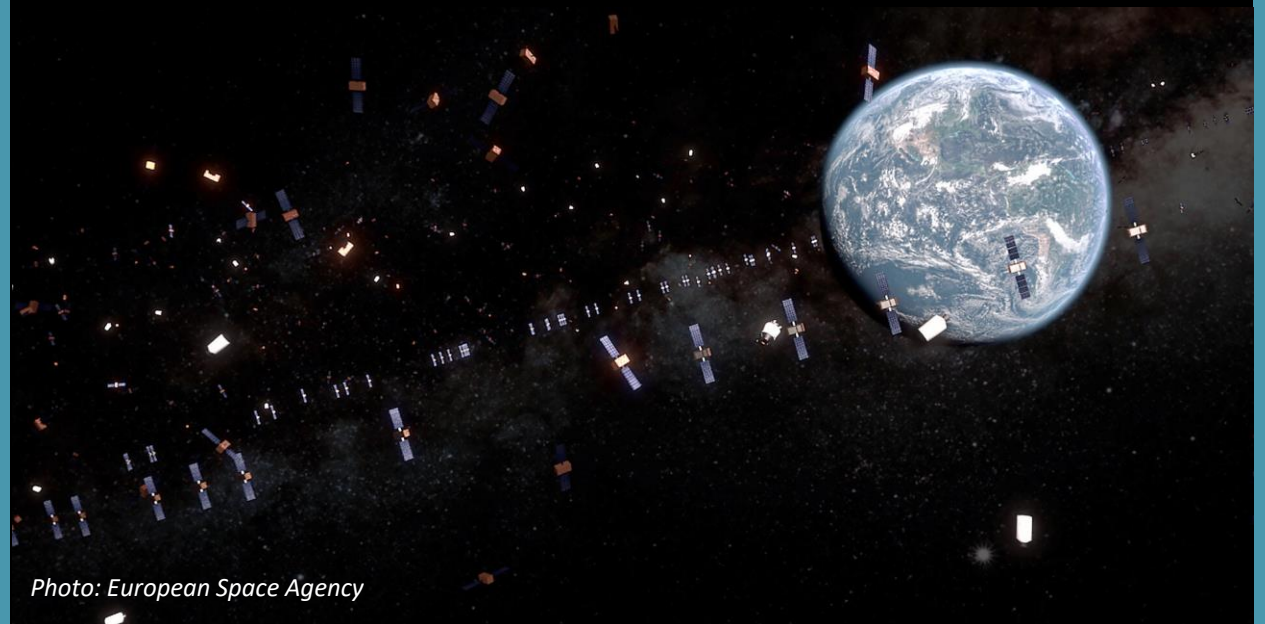


Photo: European Space Agency



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Dr.-Ing. Carsten Wiedemann is a permanently employed senior scientist at the Institute of Space Systems at the Technische Universität Braunschweig.

He is responsible for the organization and presentation of lectures, supervision of student research projects, and scientific project work. He is member of the DLR delegation at the Inter-Agency Space Debris Coordination Committee (IADC).

His field of research is modeling of the space debris environment. One important research project was the development and upgrading of the ESA MASTER (Meteoroid and Space Debris Terrestrial Environment Reference) Model. An important research focus is the dynamics of all objects in orbit. Based on orbital mechanics, the generation and decay of space debris objects of all sizes is examined in order to create a realistic model to describe the near earth's environment. The aim of the investigation is to estimate the probability of collision of these objects with spacecraft.