

# 6<sup>th</sup> International Space Debris Re-entry Workshop – WS1 Re-Entry modelling

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ESA Space Debris Office

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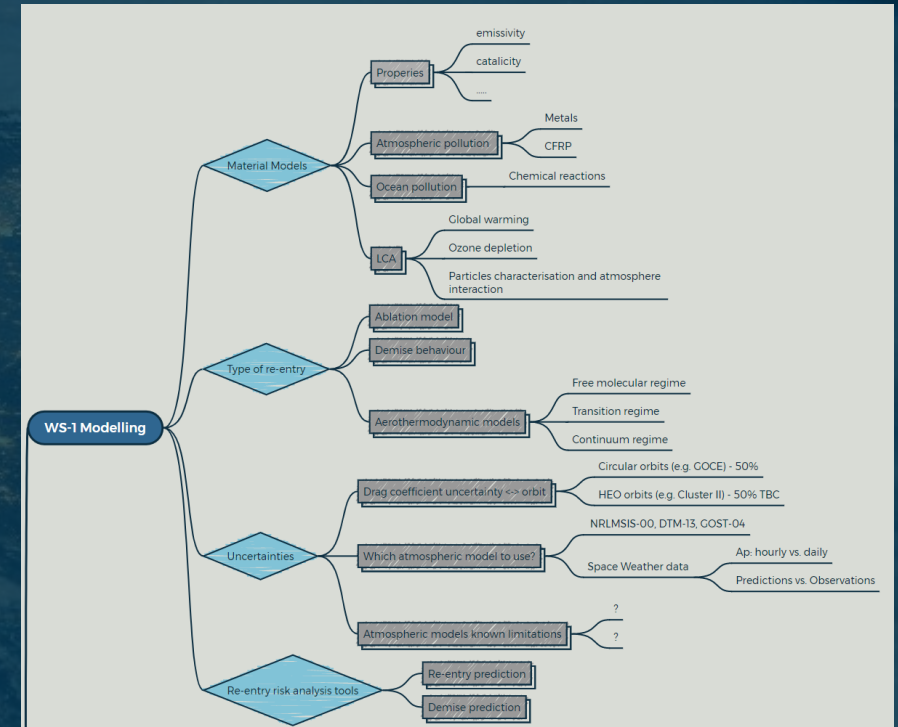
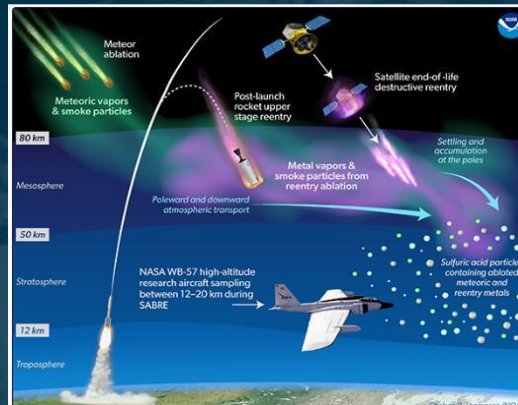
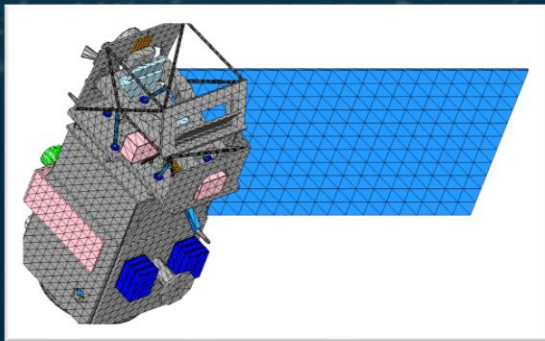
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# What to expect from WS-1: Modelling

Based on the State of the Art to discuss about known and identified gaps:

- Material models: properties, atmospheric pollution, ocean pollution, LCA
- Type of re-entry <-> ablation model
- Uncertainties characterisation per type of orbit <-> atmospheric models
- Risk analysis tools re-entry and demise characterisation differences



## Material models

Which properties are of interest? Emissivity, Catalicity....any other?

How to consider aging factor in the material models?

Metal materials model pollution: How to quantify/model the gasification rate?

CFRP material model: How to model?

## Atmospheric/Ocean pollution

How to characterise particles and atmosphere interaction? Gaps and which data is still missing?

Which data is required to understand impacts in oceans?

Which is a better paradigm in terms of environmental impact: demise during re-entry or controlled re-entry over the oceans?

## Type of re-entry

How the type of re-entry affects on the ablation model to use?

How the type of re-entry affects the demise behaviour of a re-entering satellite?

How the type of re-entry interacts with the aerothermodynamic models? Coupling methods will improve the current knowledge?

## Uncertainties

How the type of re-entry affects on the uncertainties to be applied to the drag coefficient?

- 20% for circular orbits is a common understanding...could it be better predicted?
- 50% for HEO orbits is a very conservative approach?

Which atmospheric model represents better the reality? Which is its associated uncertainty?

How space weather data should be accounted:  $A_p$  (hourly vs. daily), predictions vs. observations?

Which are the atmospheric models known limitations?

## Re-entry risk analysis tools

How the type of re-entry risk analysis tools affects on the re-entry predictions?

Which are the limitations on high-fidelity tools for re-entry risk analysis for big spacecrafts?

How the type of re-entry risk analysis tools affects on the demise prediction?

Could we rely on low fidelity tools to generate reliable predictions?

# WS1: Which data are you interested in?

## Instructions

Go to

[www.menti.com](https://www.menti.com)

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