

# DebRisk: a model for space-debris risk assessment and forecasting focused on space launching systems

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# The right “staff”



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# Summary

- Space debris is becoming an ever-increasing risk for space activities.
- Today most of the models for risk assessment and forecasting focuses on the effect that relatively small objects have on functional satellites and manned space vehicles in orbit, e.g. the ISS.
- The impact risk of those debris against launching systems, upper stages of rockets, sounding rockets, recoverable vehicles and even future manned vehicles for commercial usage (e.g. suborbital touristic flights) is only considered at the time of launch.
- We present DebRisk, a model for assessing and forecasting the impact of future space-debris population on space launching systems.
- The model, which includes a general methodology, forecasting techniques and a computational open source package, is intended to calculate the critical properties of future space-debris population (total number of particles, size distribution, orbital distribution) able to create critical levels of risks for launching activities.

*Happens in real life, happens in... movies*



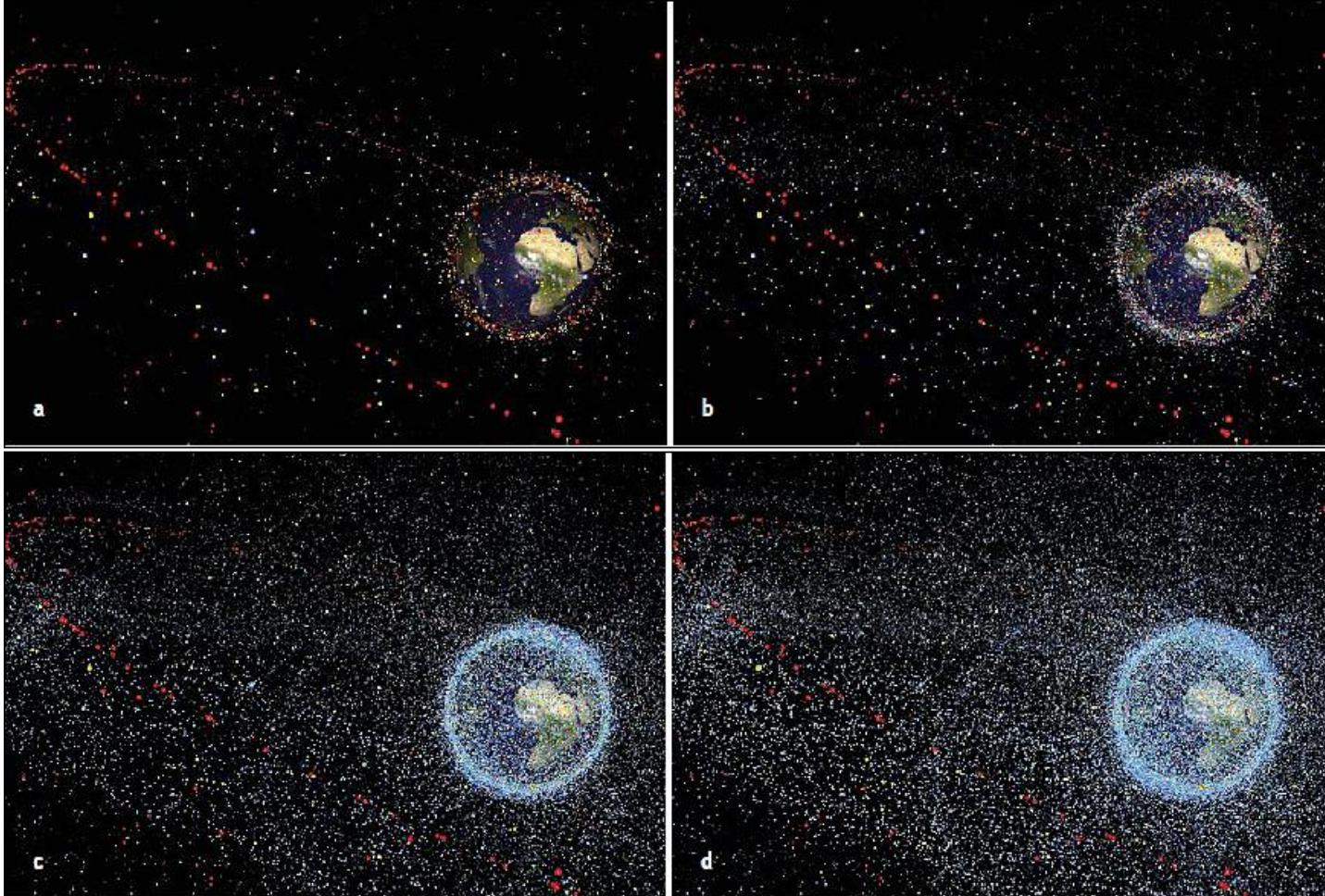
*Happens in real life, happens in... movies*



# Context



ESA MASTER model



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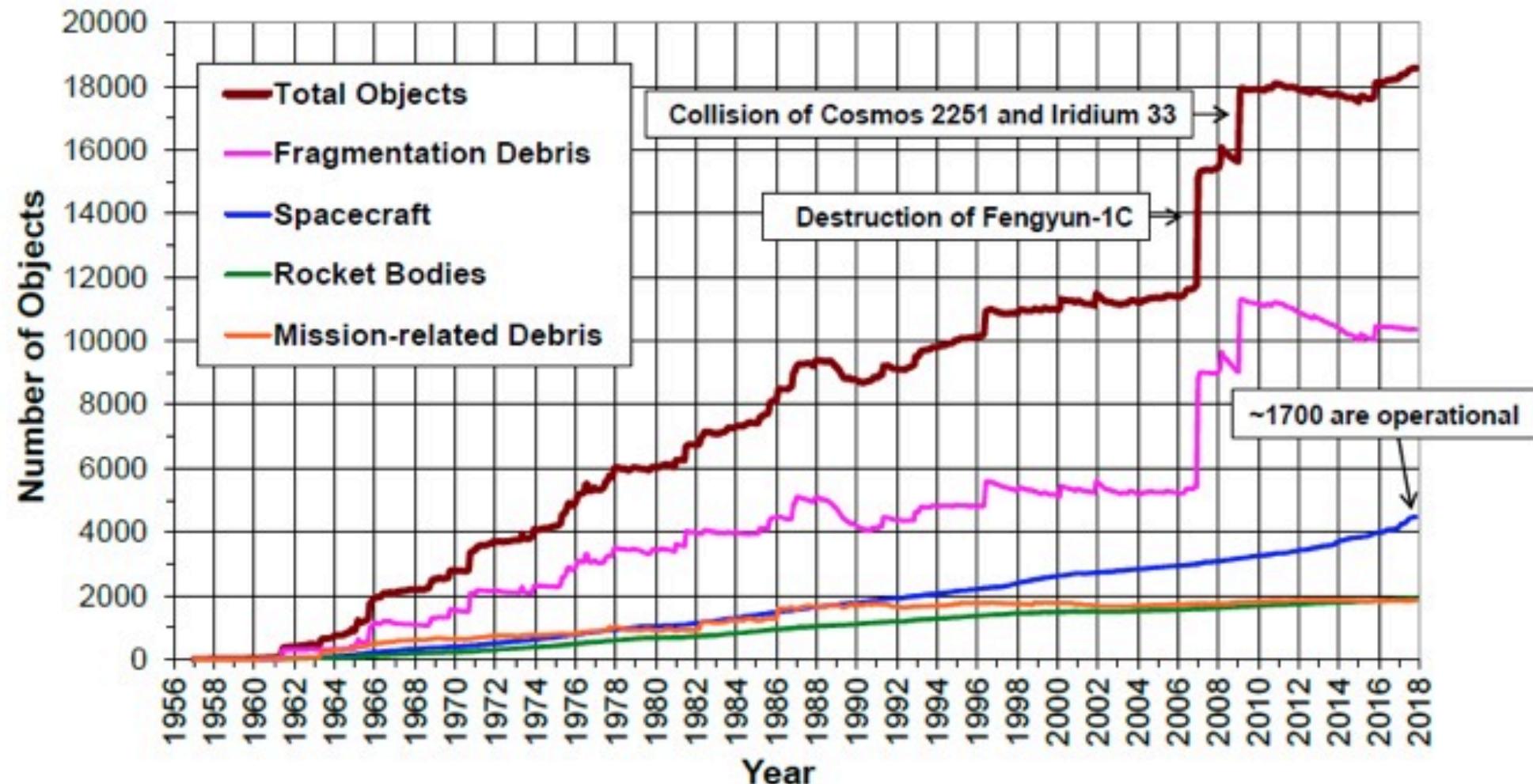


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# Context

Lewis, 2018

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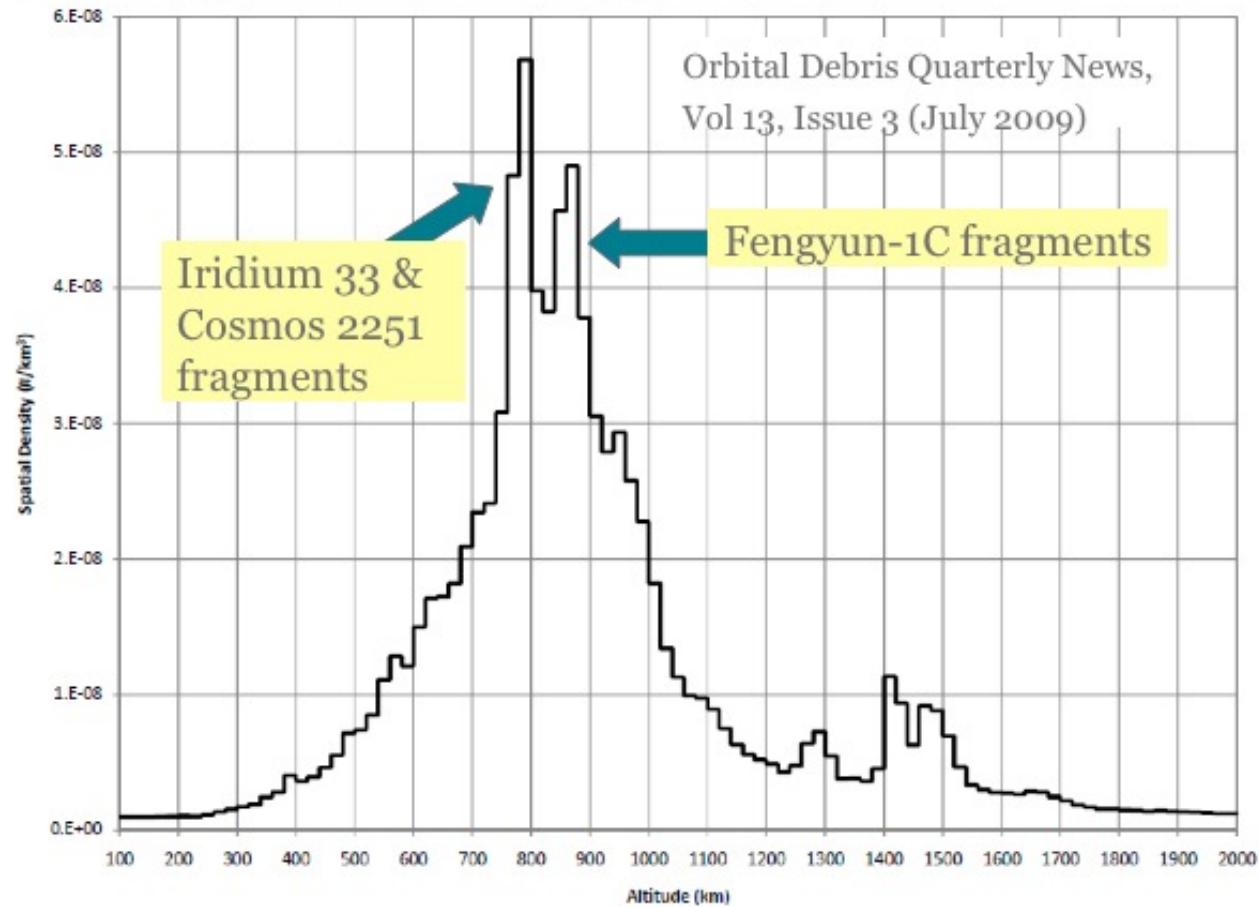
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## Debris spatial density June 2009



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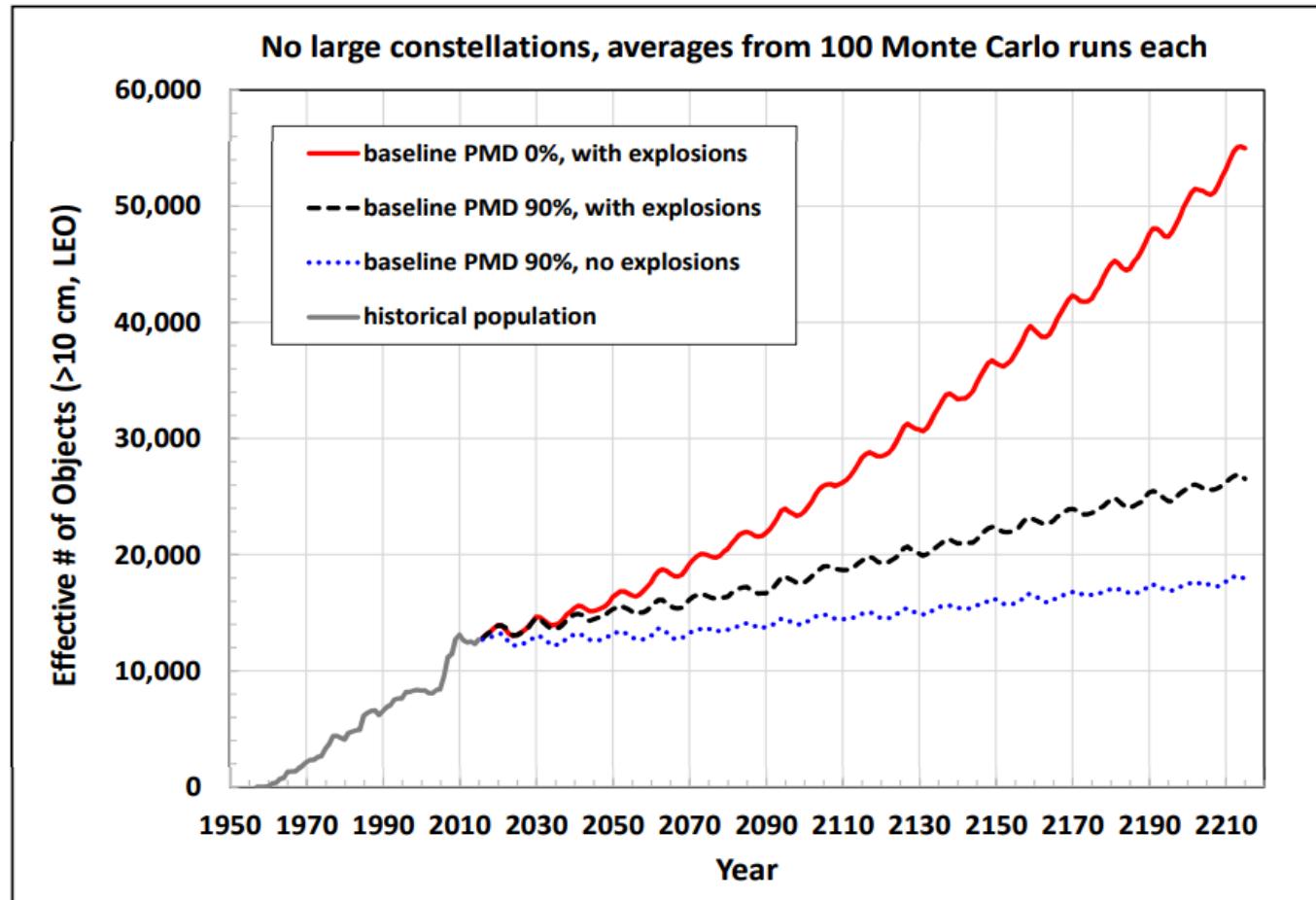


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Orbital Debris Quarterly News, Vol. 22, Issue 3, September 2018



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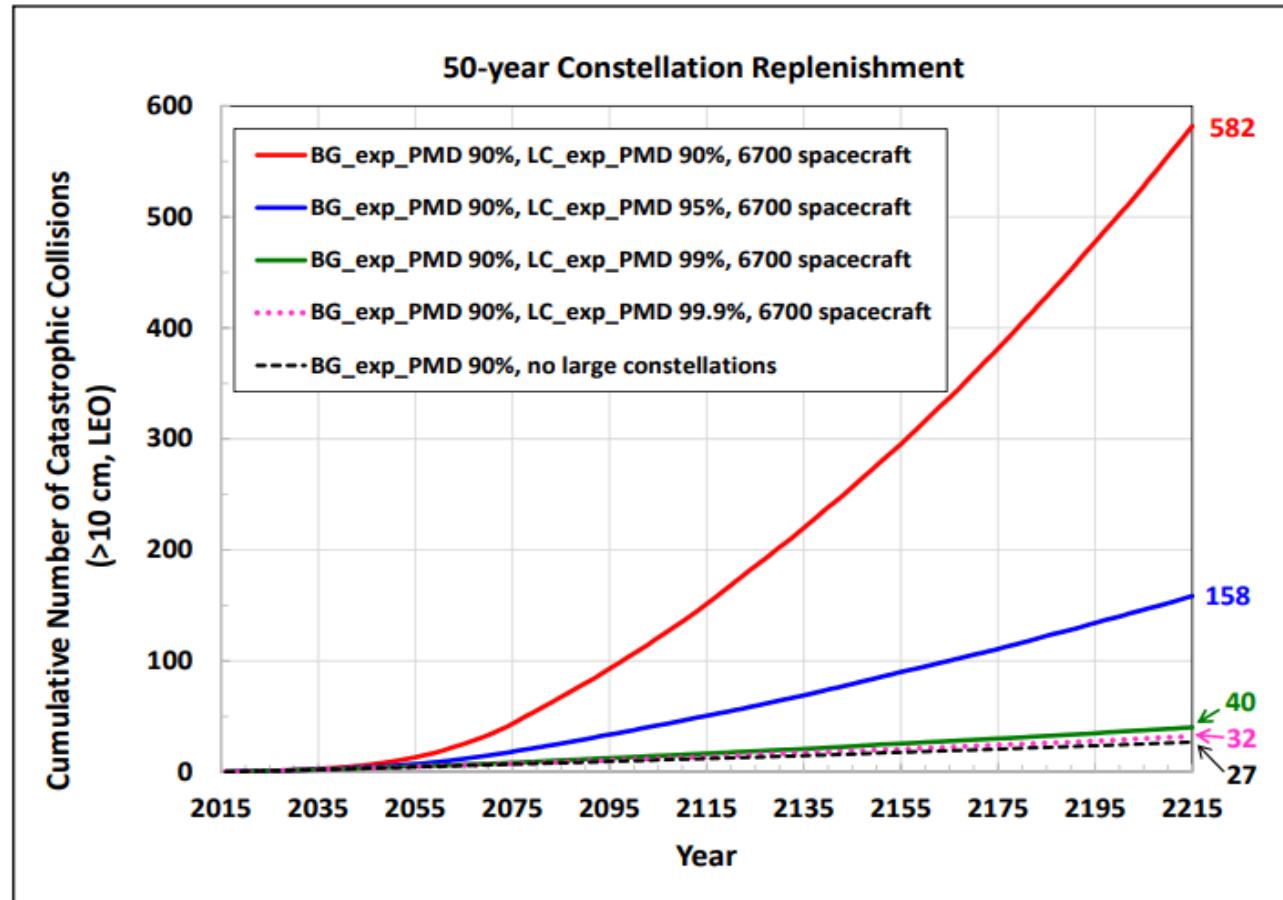


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# Context



Orbital Debris Quarterly News, Vol. 22, Issue 3, September 2018



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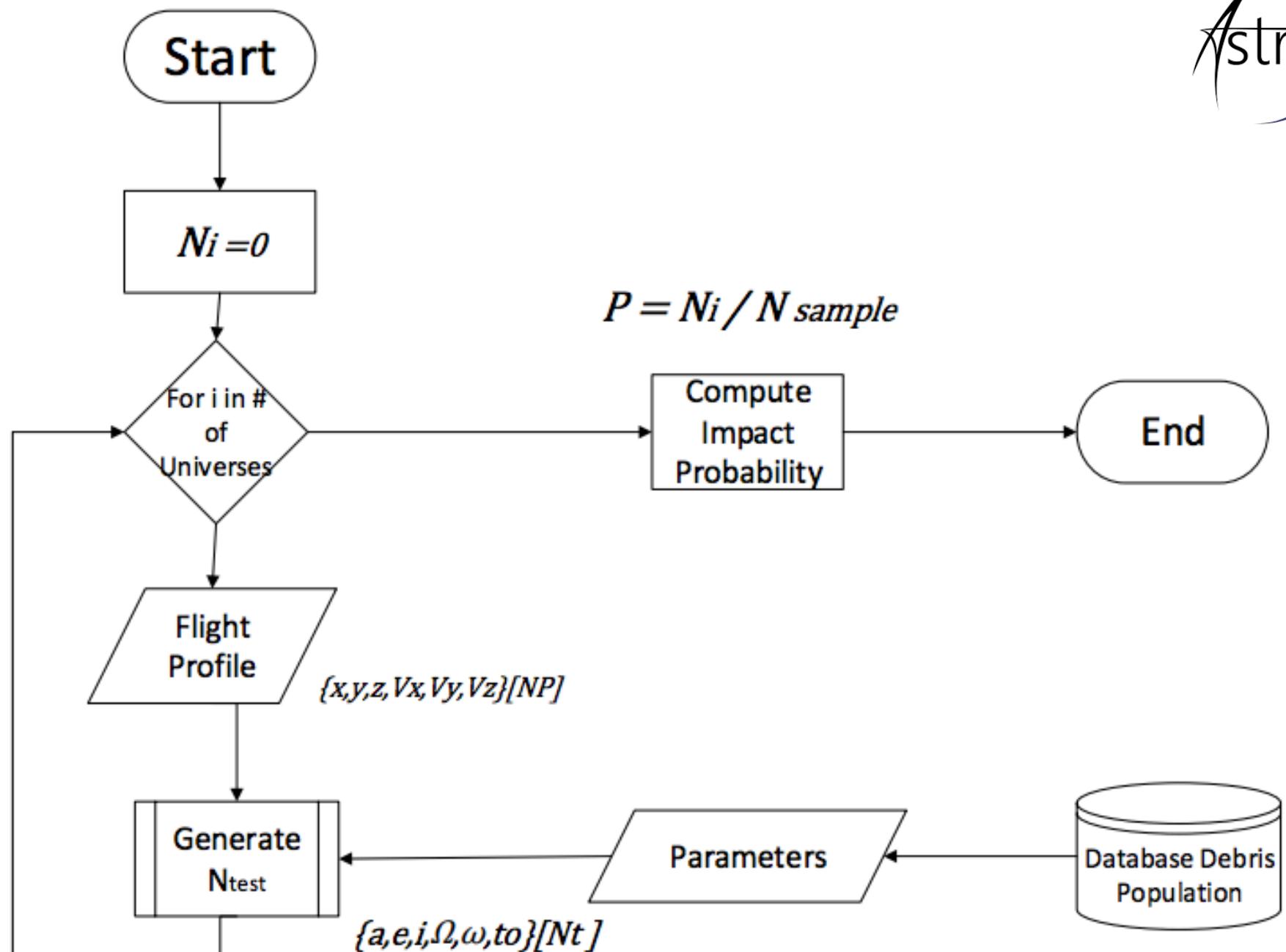
Zuluaga, Puerta, Zapata, Molina & Arenas (2018)



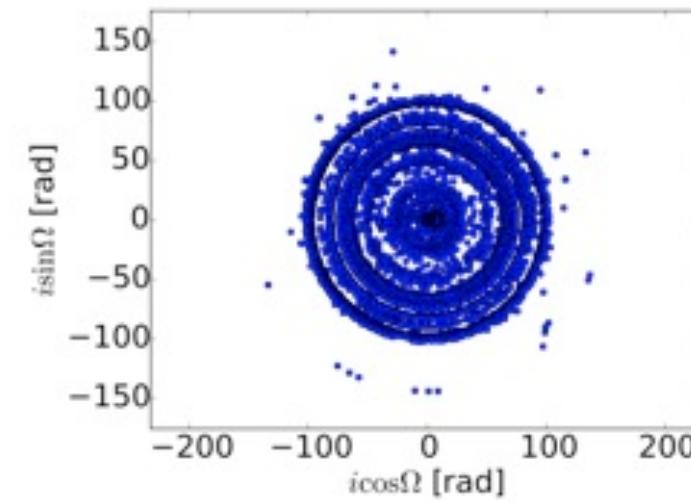
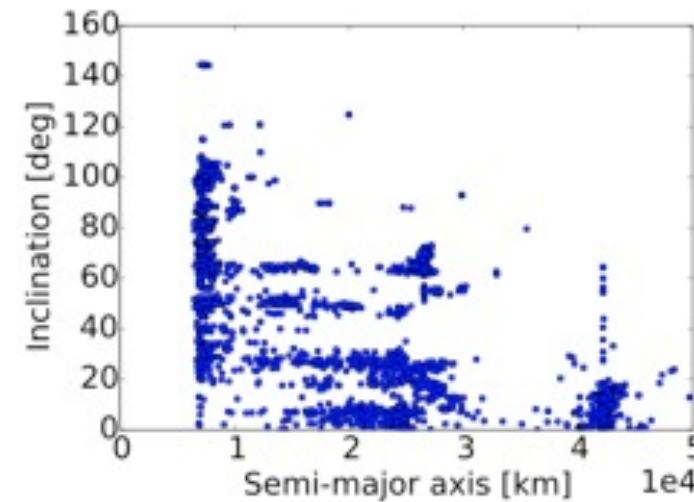
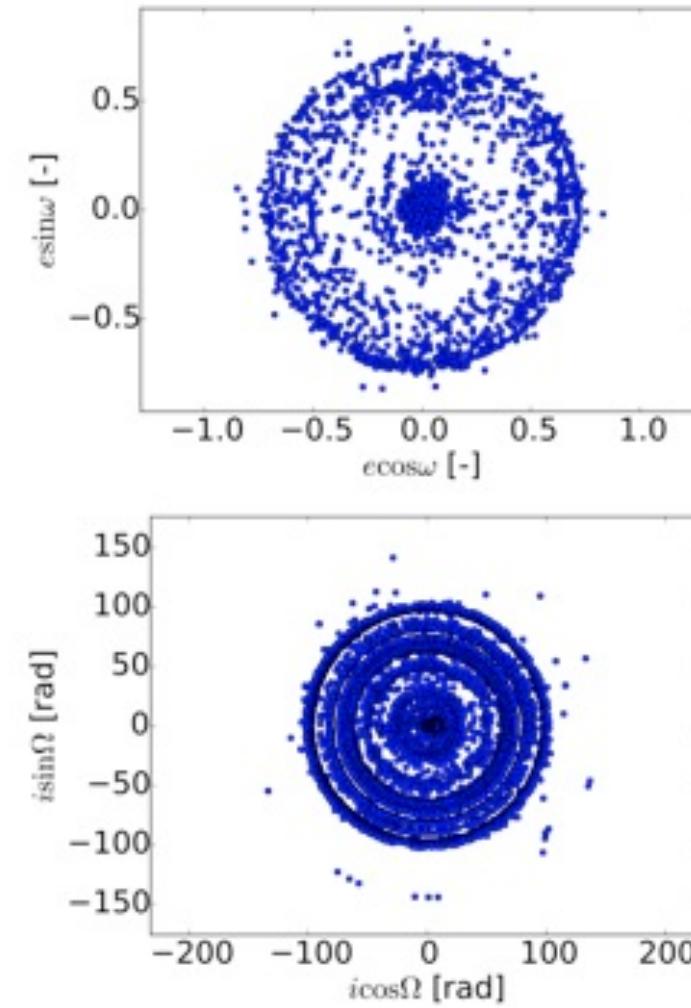
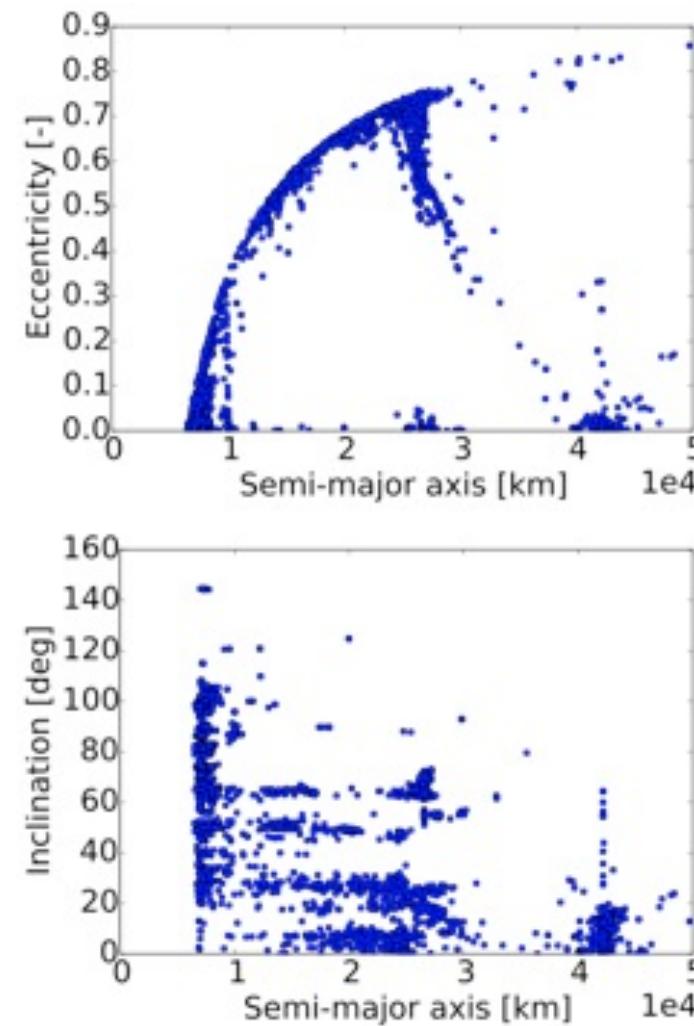
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# Methods

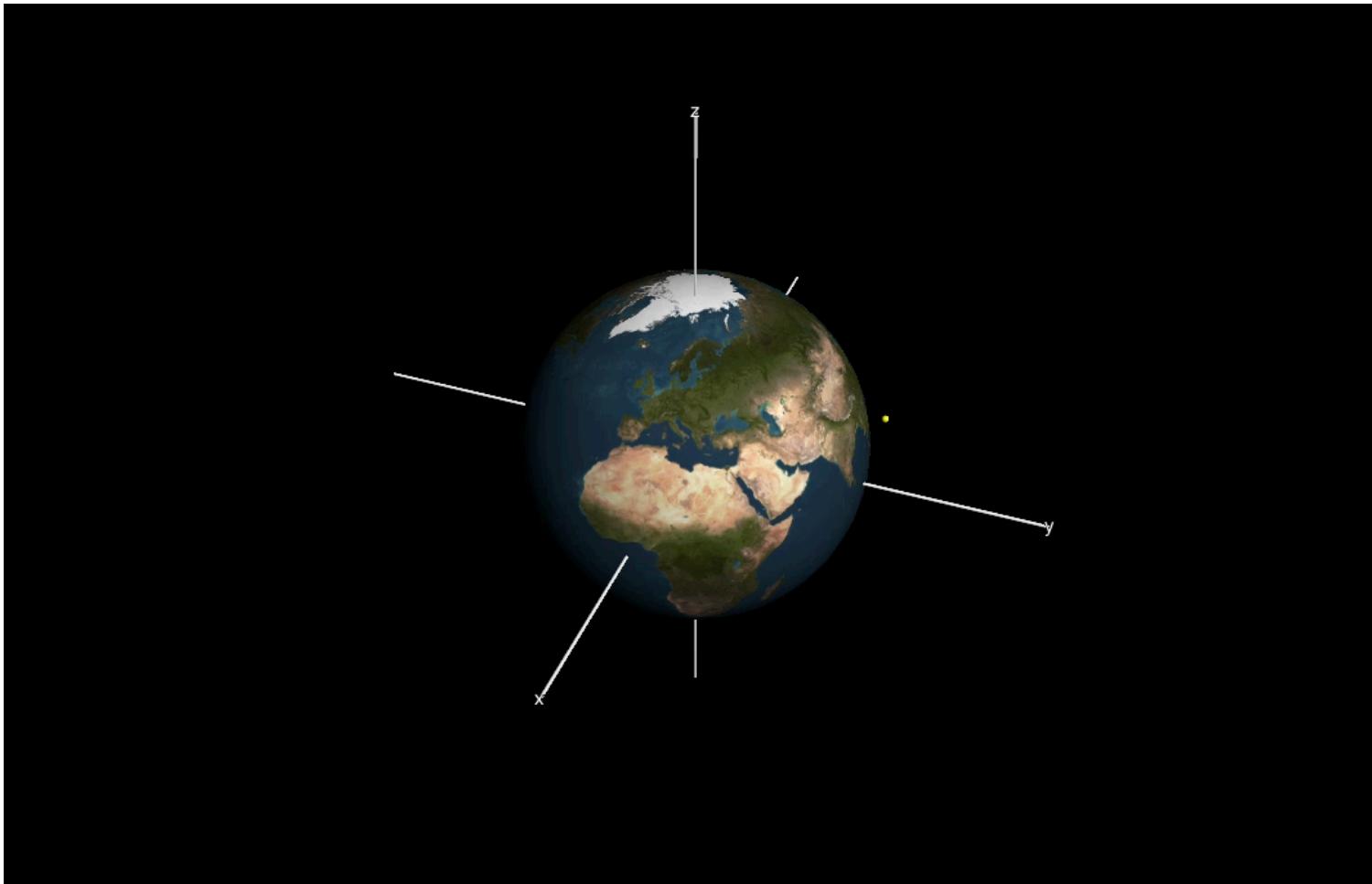
## DebRisk algorithm



# Methods



# Methods



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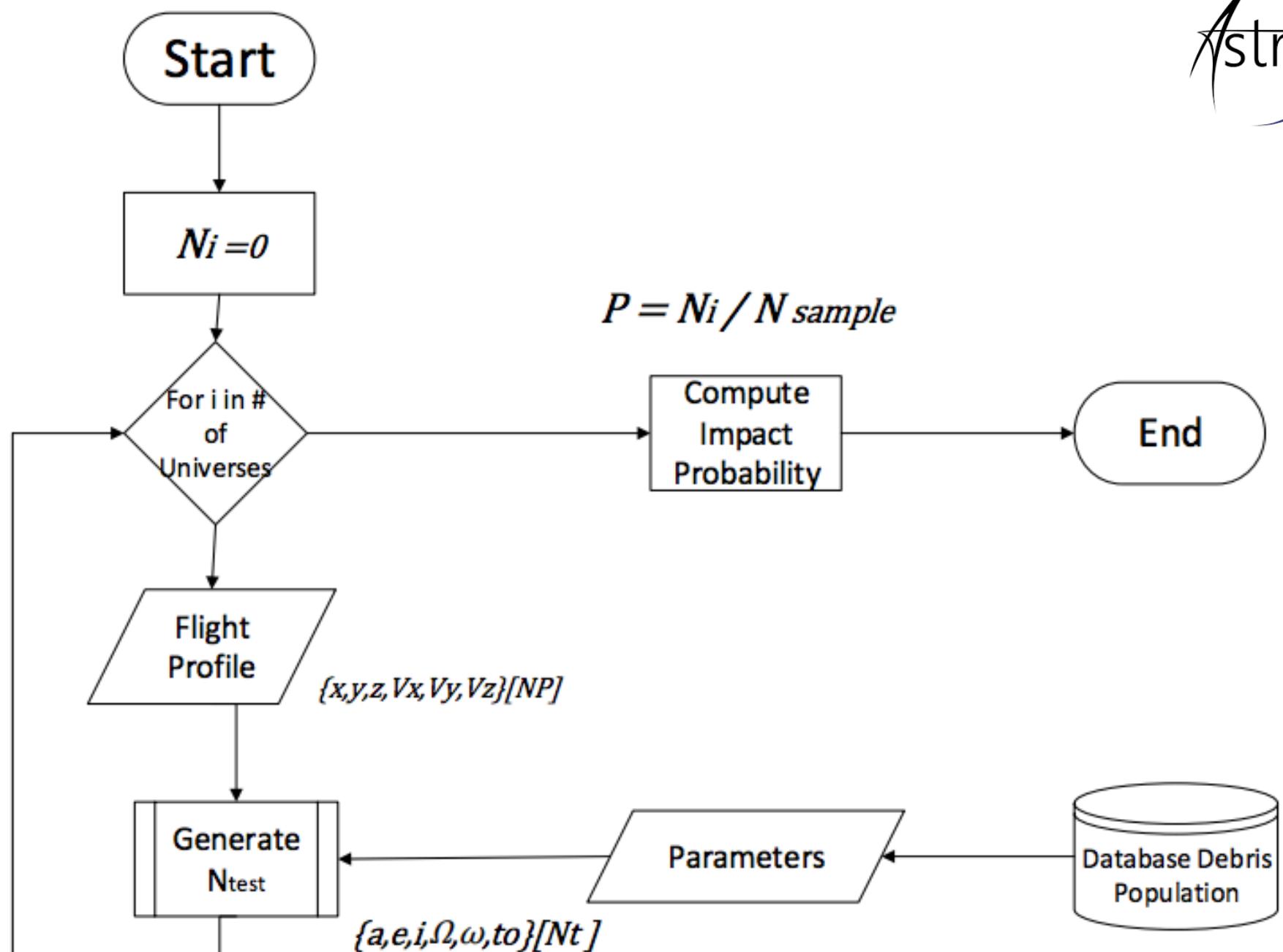


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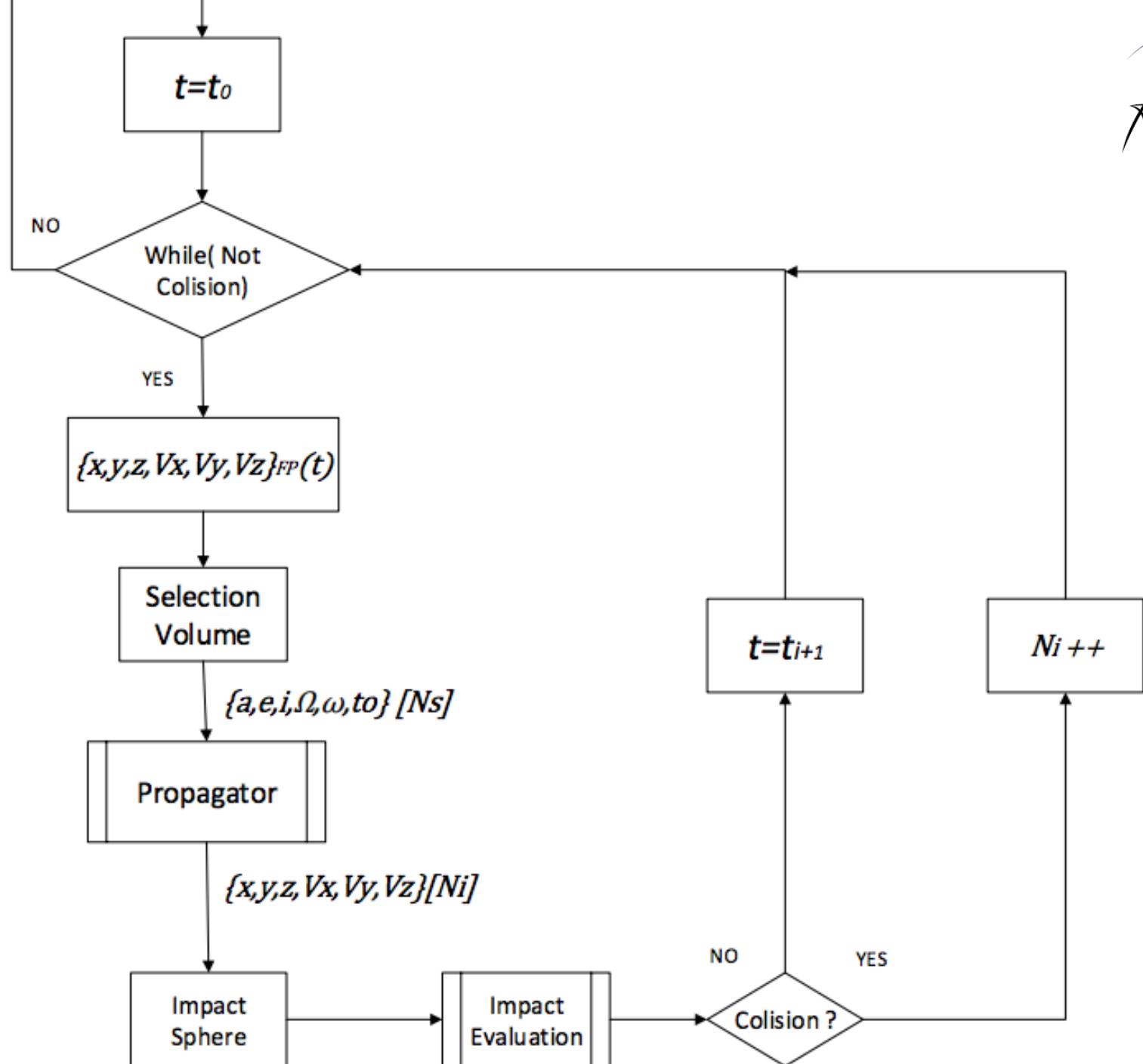
# Methods

## DebRisk algorithm

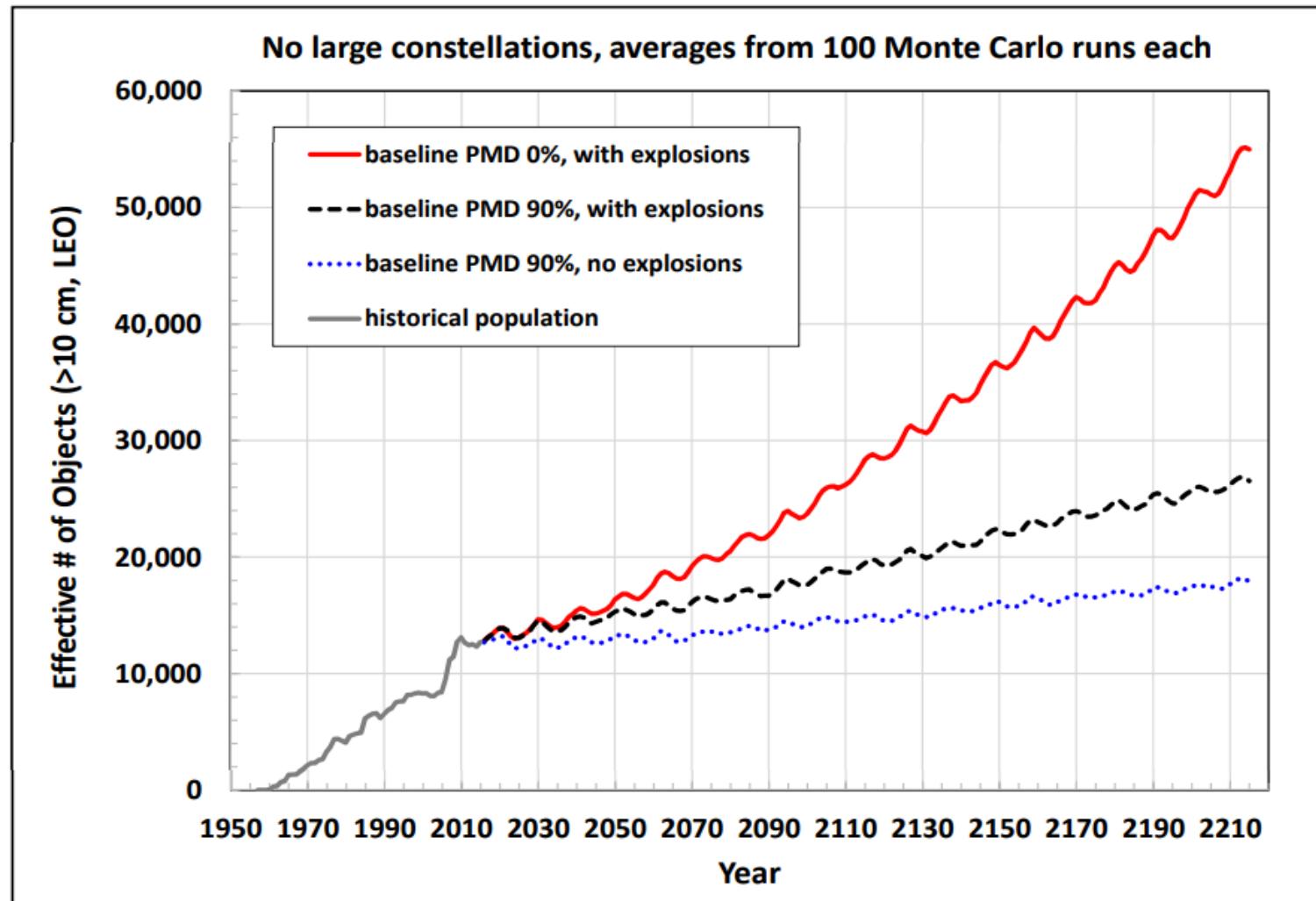


# Methods

## DebRisk algorithm



# Expected results

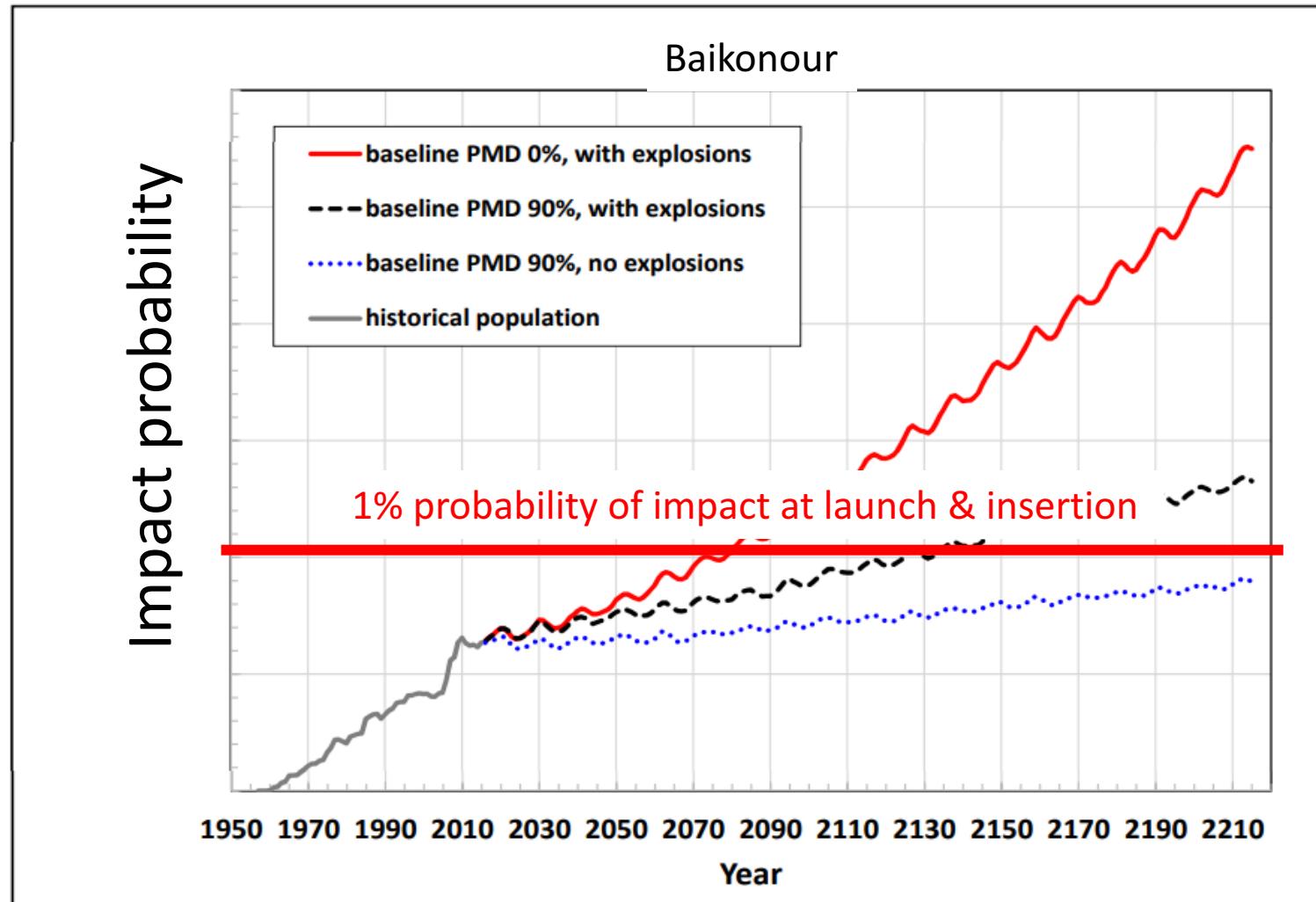


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# Expected results



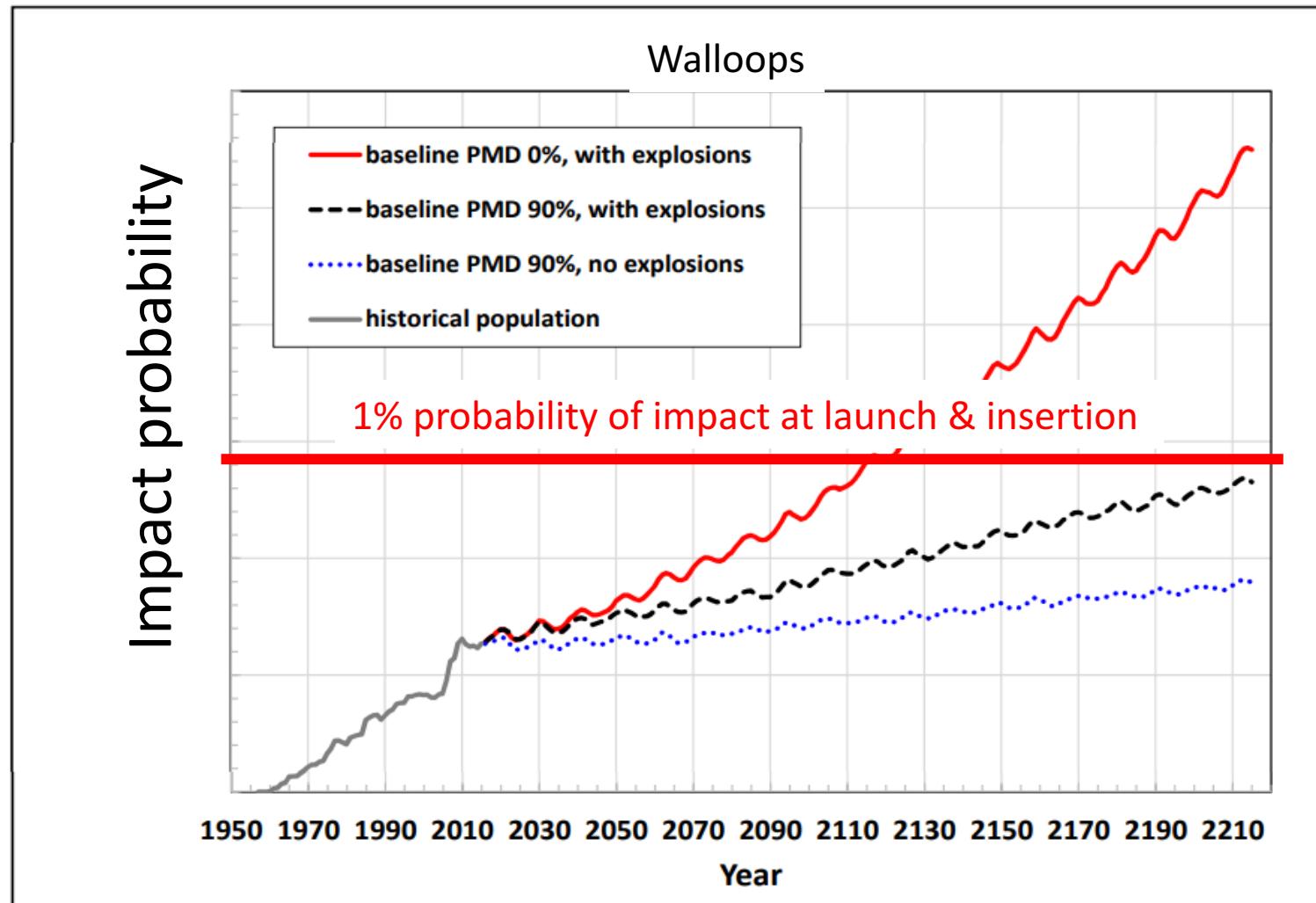
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# Expected results



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# Status

- Model: **ready**
- Flight profile generator: **ready**
- Integrator: **ready**
- CICTA presentations (society): **on-going**
- Monte Carlo simulations: **pending**
- Model test: **pending**
- Preliminary results: **pending**



# Questions?



"Finding Nemo" © Disney / Pixar

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