

A field of stars with Gliese 710 highlighted in the center. The star is a bright yellow-white point with a four-pointed diffraction pattern. The background is a dense field of smaller, dimmer stars of various colors.

Gliese 710

a Star approaching

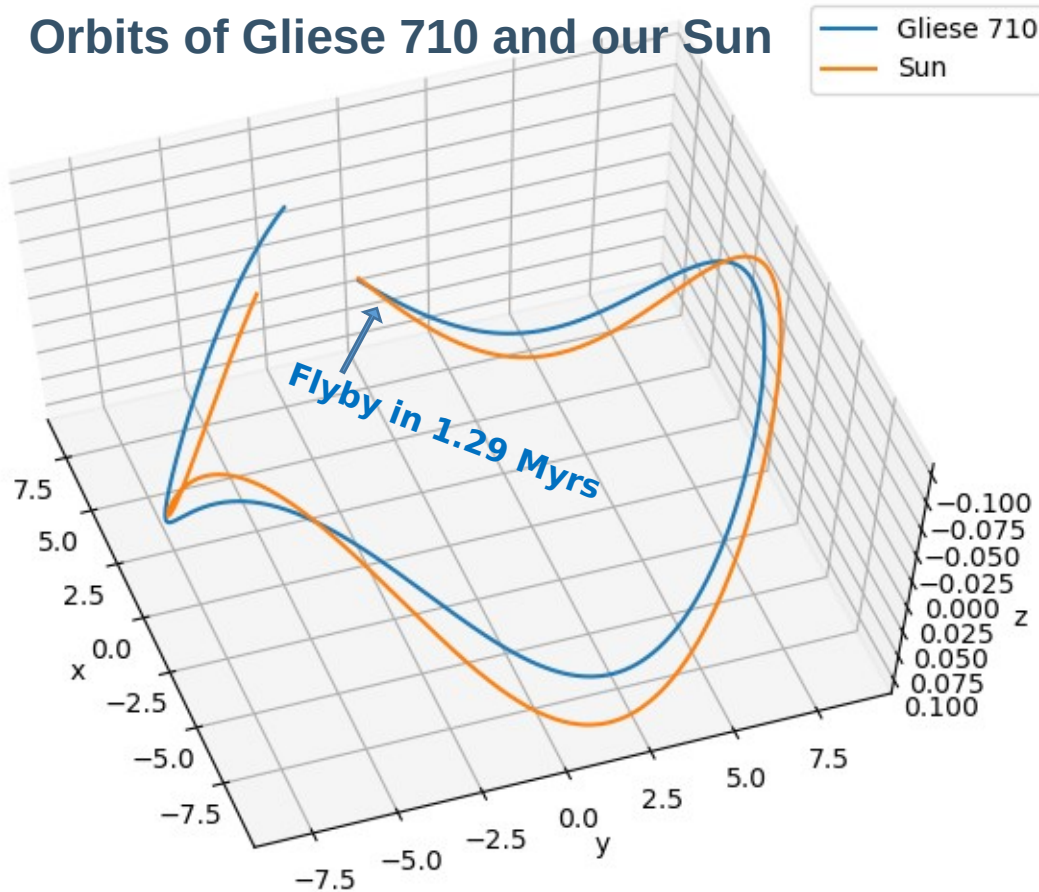
the Solar System

Project financed by



Facts about GLIESE 710

Orbits of Gliese 710 and our Sun



Flyby distance to Sun: 10500 au
according to Gaia Data (DR3 2022)

Gliese 710

is a K-type star
has 60% Sun-mass
is on a hyperbolic orbit
with velocity of 14.4 km/s

Closest Distance to Sun according Gaia Observations

2016 Gaia DR1: 13 365 au (Berski and Dybcynski)

2018 Gaia DR2: 10 721 +- 2114 au

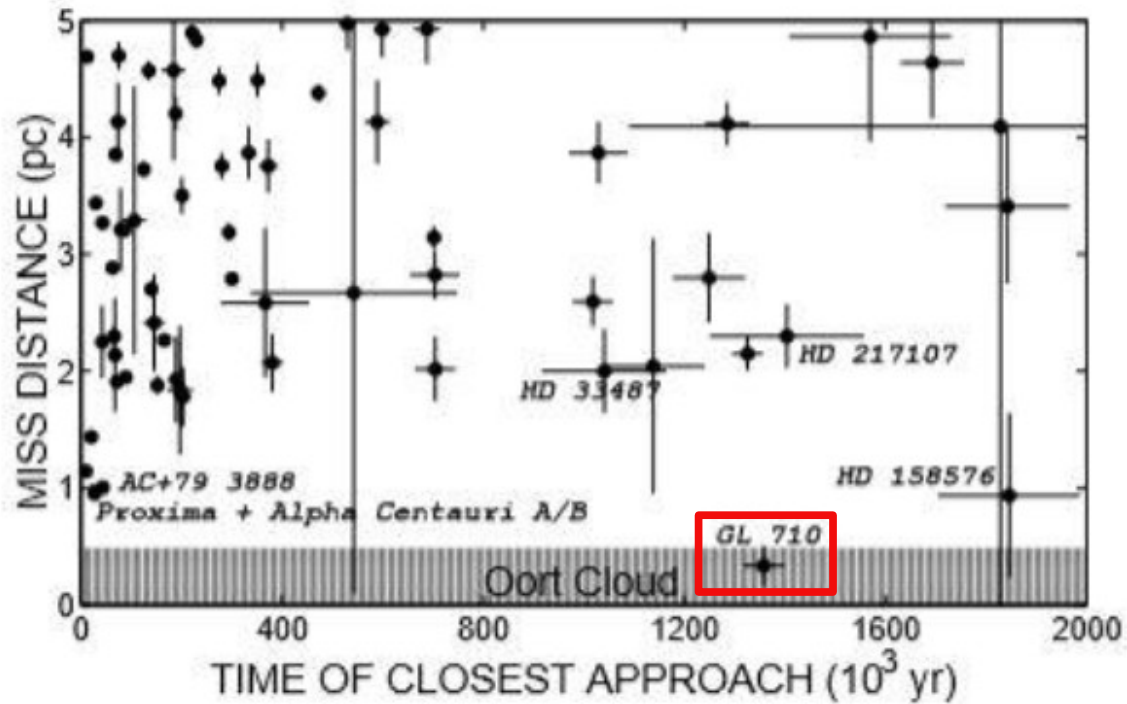
Data from GAIA + HIPPARCOS + N-body simulation:

Closest distance at **4303 au**
(De la Fuente Marcos & De la Fuente Marcos)

2022 Gaia DR3 ~10500 au

Passage through Oort Cloud

Observational evidence:



Garcia-Sánchez et al., 2001 (Hipparcos data)

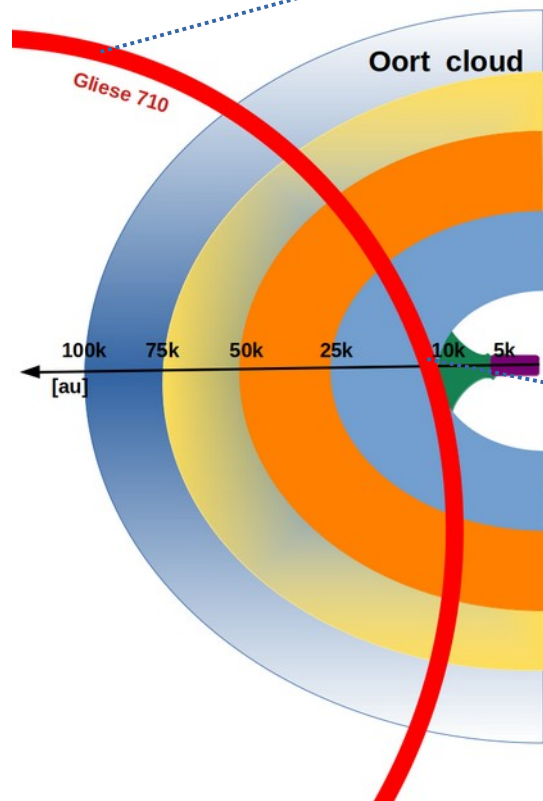


Cloud of 10^{12} Comets

Sketch of the numerical Set-up:

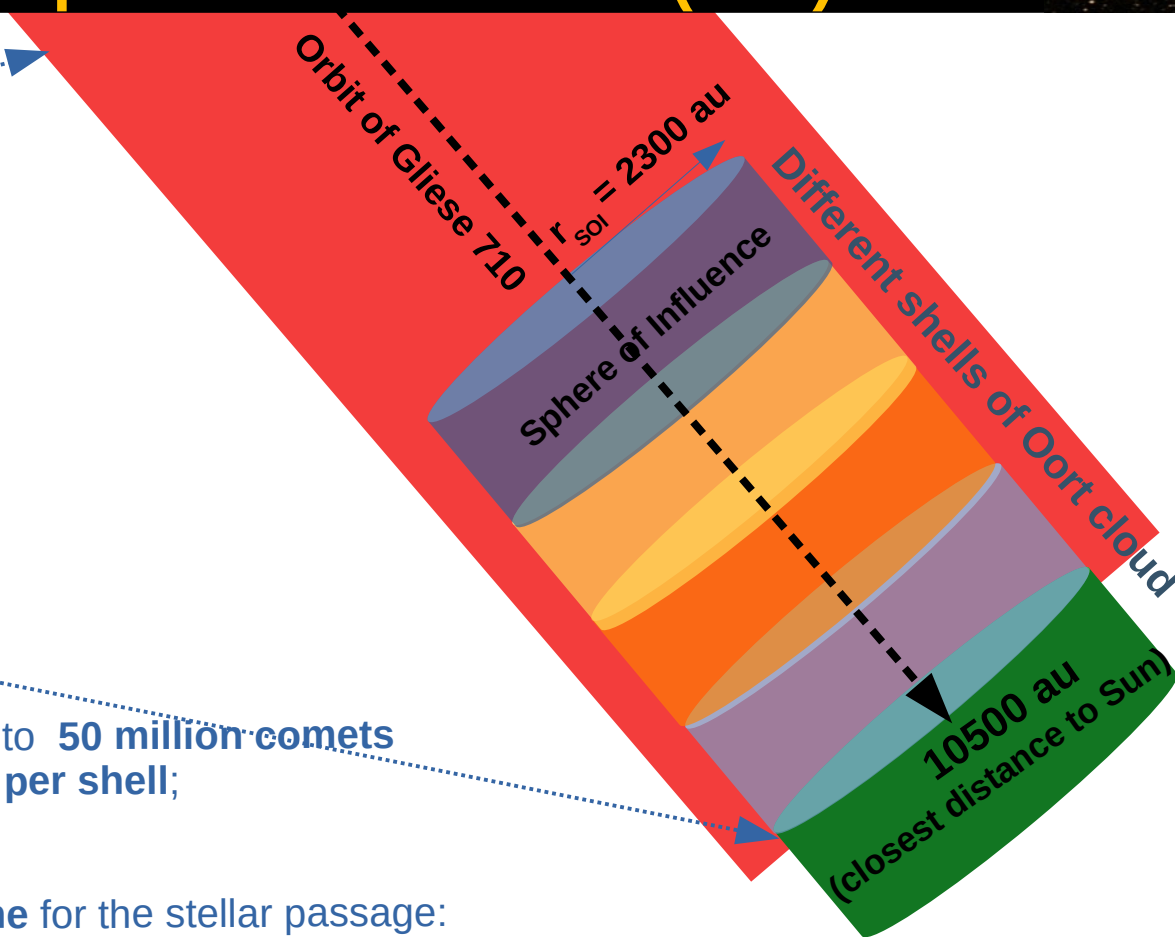
Oort Cloud Comets & Sphere of Influence (SOI) of Gliese 710

Sketch of defined Oort cloud shells and orbit of Gliese 710



We computed up to **50 million comets** (non-interacting) per shell;

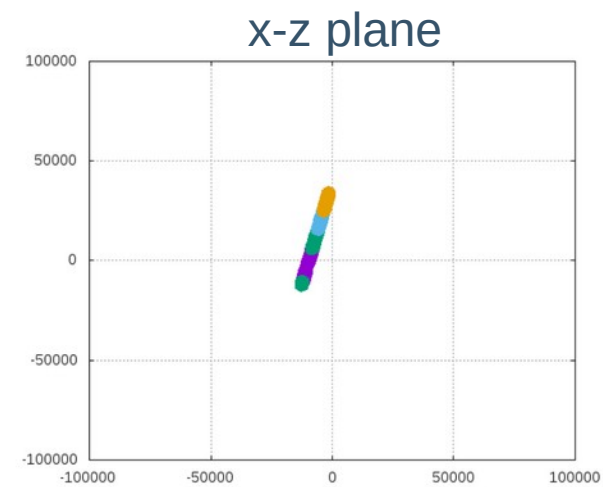
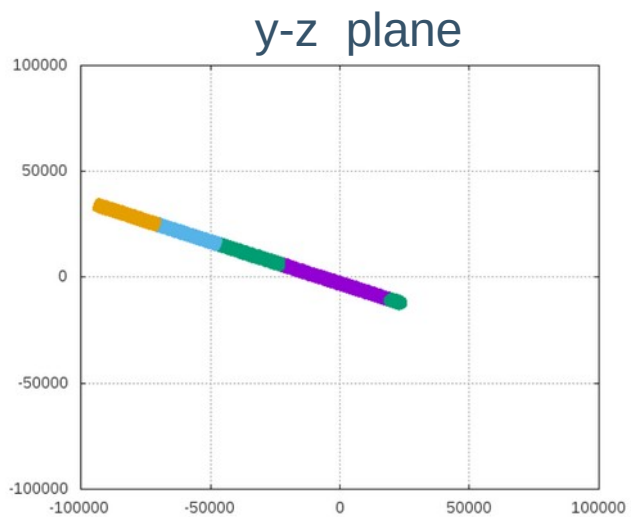
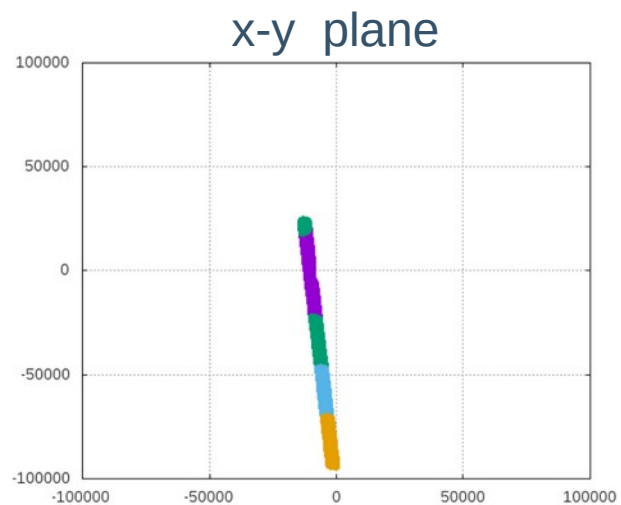
Computation time for the stellar passage:
~64000 years



N-body simulations using our GPU N-body code “GANBISS”
(M. Zimmermann & Pilat-Lohinger CeMDA 2023)

Perturbations caused by the flyby of Gliese 710 displayed in different planes

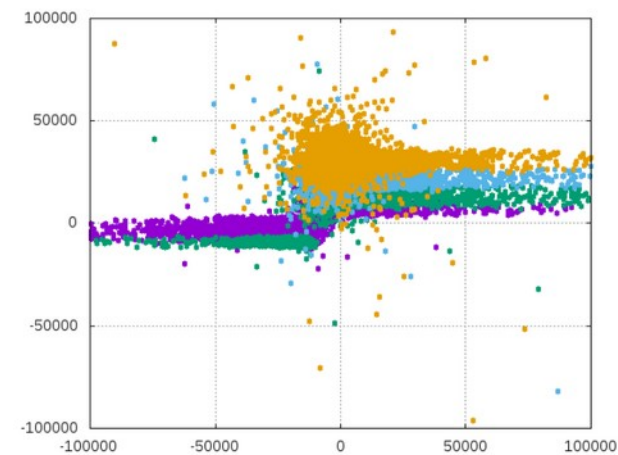
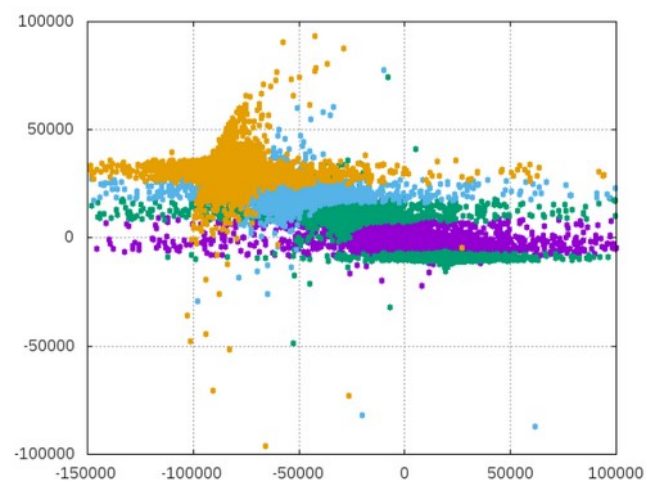
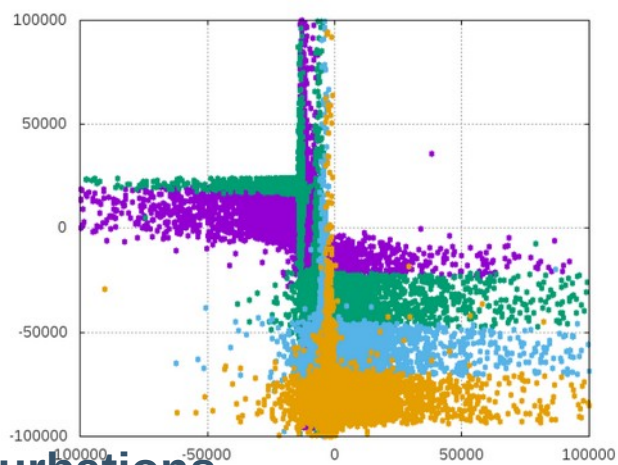
Before Flyby



After Flyby

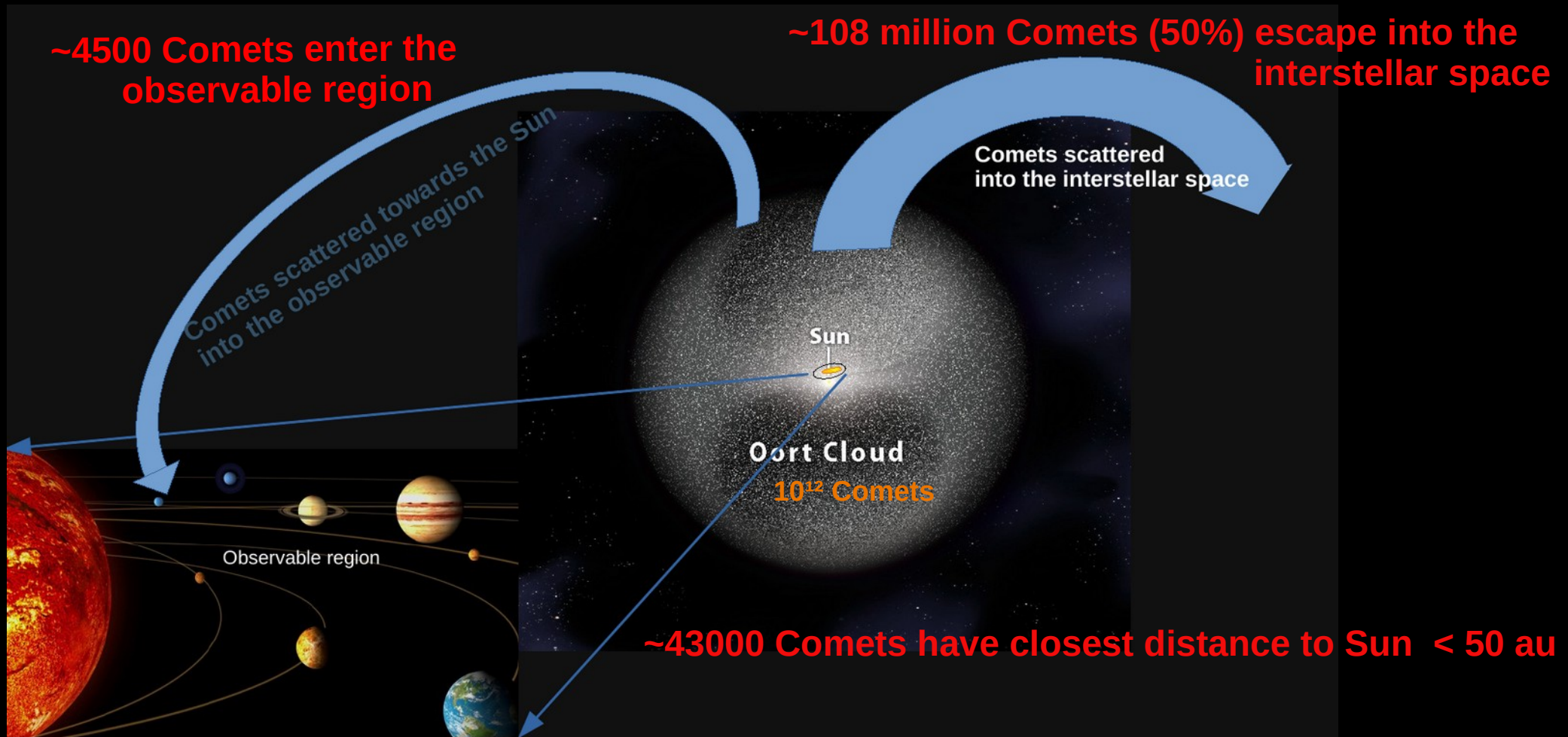


**Stronger perturbations
in x and y direction
than in z**



Cometary Scattering after Flyby

Flyby distance : 10500 au / $v = 14.4$ km/s / $r_{\text{SOI}} = 2300$ au
Scattering of the 220 million objects in the SOI:



Summary

Considering only the region around Gliese710's orbit (= Sphere of Influence – SOI)



Object density is close to the real one



Perturbations due to the
Passage of Gliese 710



~4500 comets
will be scattered towards
the Sun into the observable
region and thus towards
planet Earth

More than 50 % of the comets
of the SOI will be ejected

A series of stellar fly-bys could reduce
or even remove a cloud of comets like
our Oort Cloud