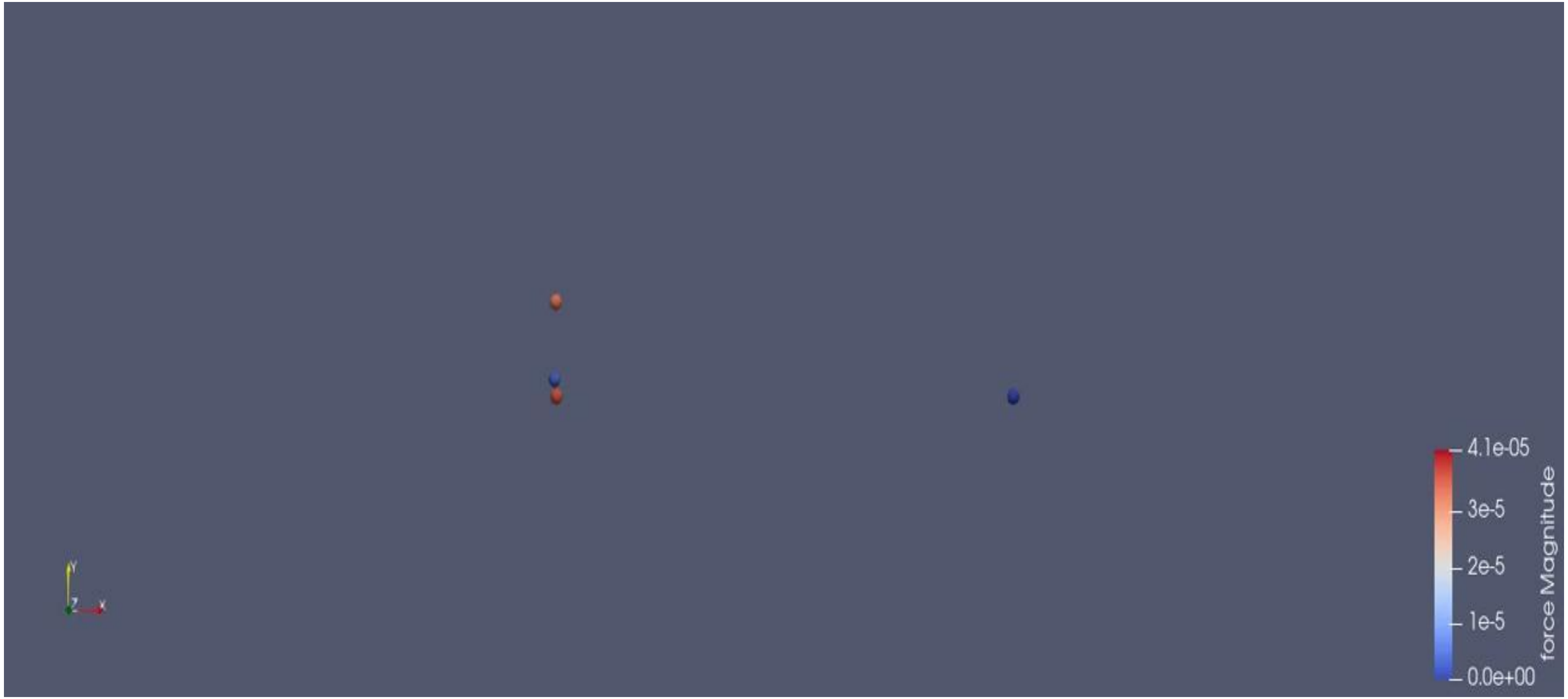
# Week 1 - Halley’s Comet

Main Tasks:

- get familiar with build system(CMake) and documentation(doxygen)
- insert force, velocity and position calculation in given Project Frame
- implement ParticleContainer class
- get familiar with Paraview and use program output to visualize the simulation

# Simulation:

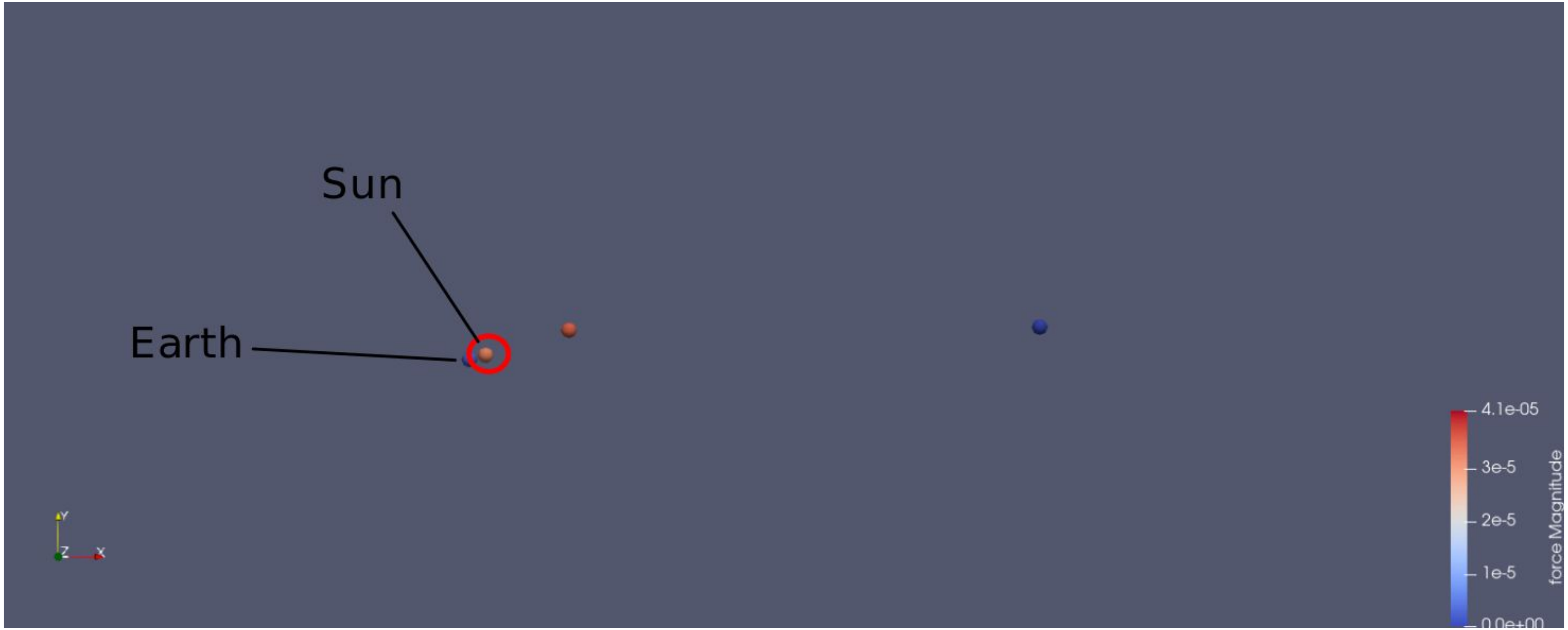
```
$ ./MolSim -e 0.014  -t 1500 -f eingabe-sonne.txt
```



# First Celestial Body:

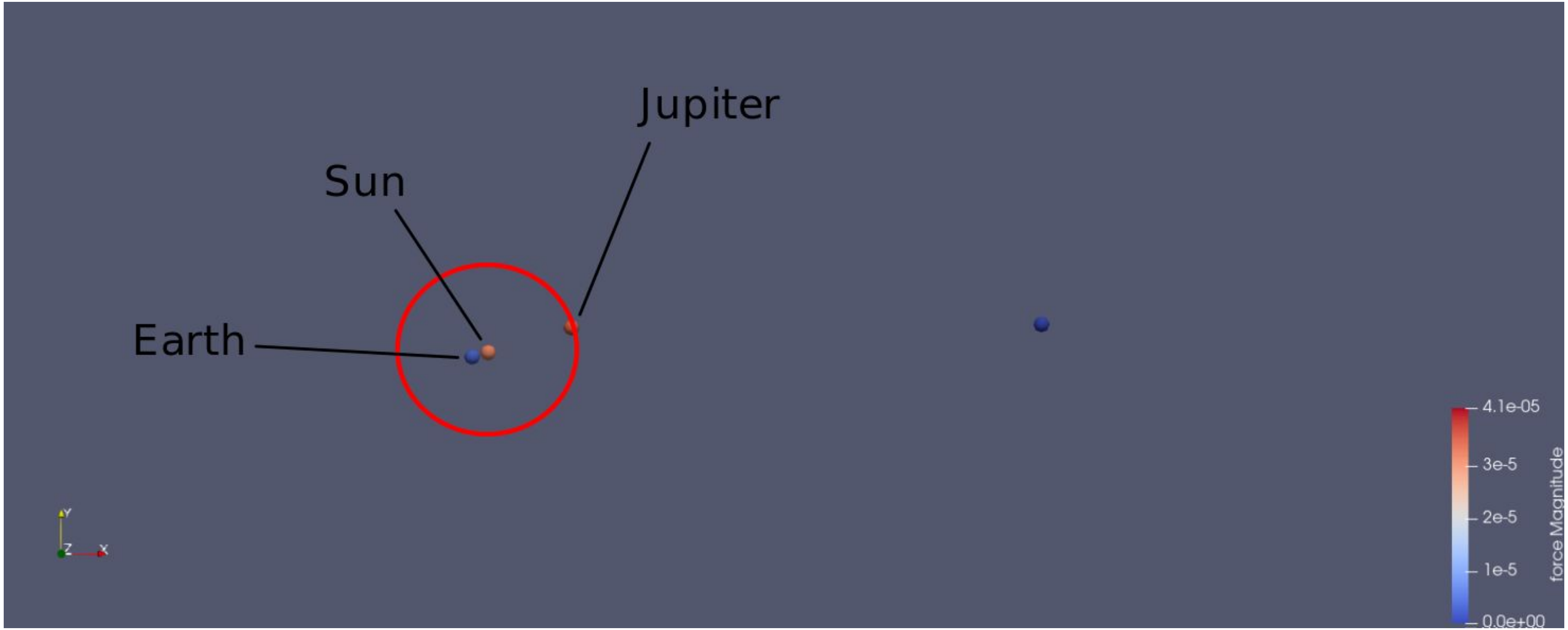
Assumption: all masses are normalized to the mass of the sun, which is $1.9855 \times 10^{30} kg$

$$\longrightarrow 3.0 \times 10^{-6} (sununit) = 3.0 \times 10^{-6} \cdot 1.9855 \times 10^{30} kg \approx 5.972 \times 10^{24} kg$$



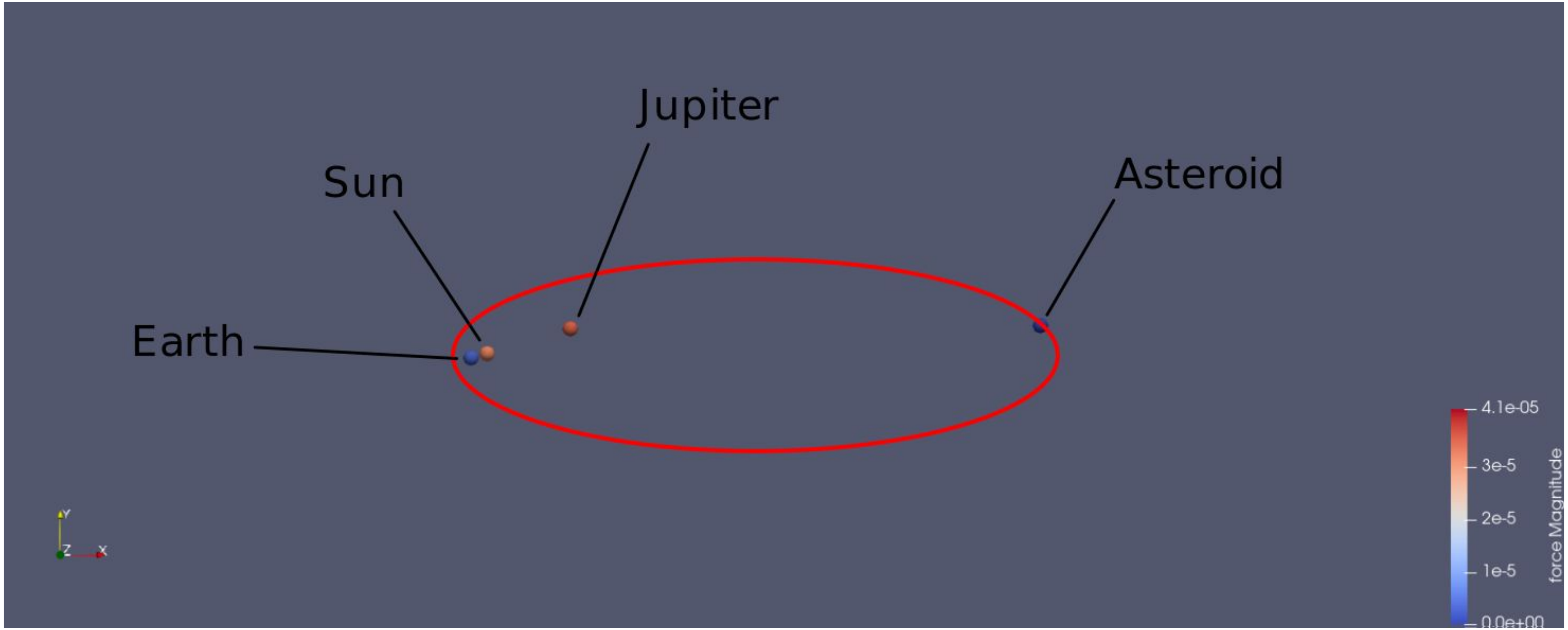
# Second Celestial Body:

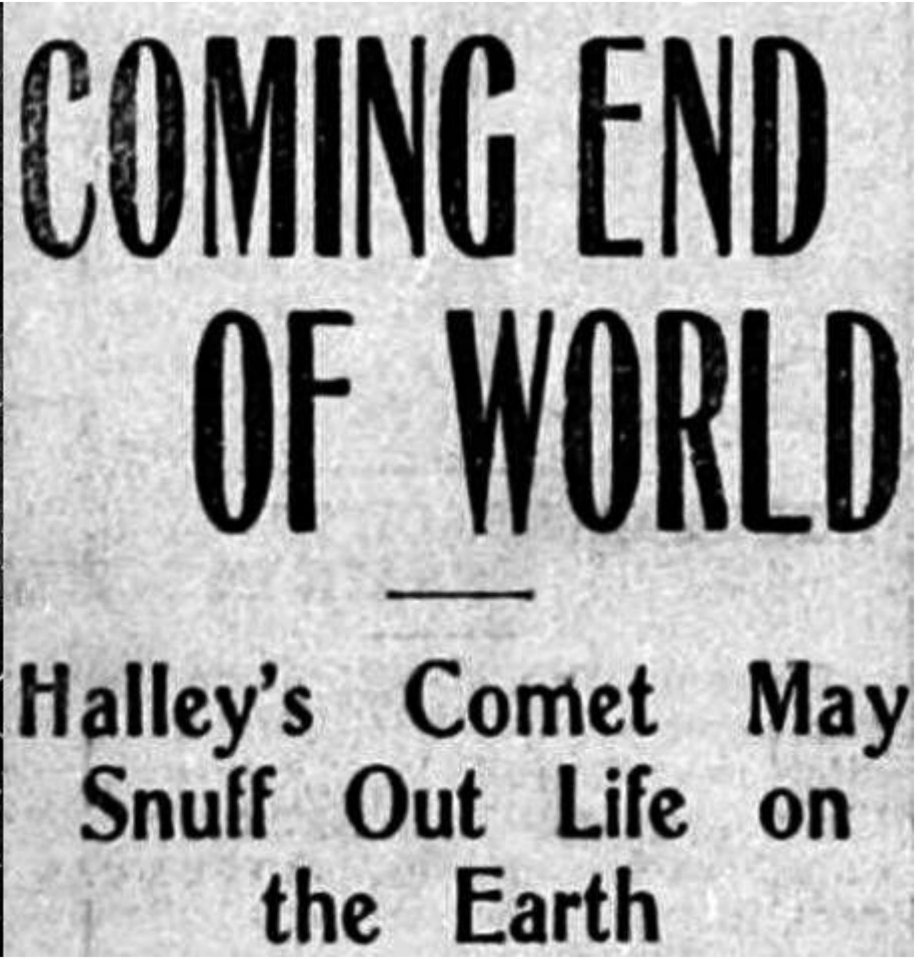
$$\longrightarrow 9.55 \times 10^{-4}(sununit) = 9.55 \times 10^{-4} \cdot 1.9855 \times 10^{30}kg \approx 1.8987 \times 10^{27}kg$$



# Third Celestial Body:

$$\longrightarrow 1.0 \times 10^{-14}(sununit) = 1.0 \times 10^{-14} \cdot 1.9855 \times 10^{30} kg \approx 1.9855 \times 10^{16} kg$$





# COMING END OF WORLD

Halley's Comet May Snuff Out Life on the Earth

# ParticleContainer:

- offers iteration over particles and particle pairs
- uses std::vector<Particle> class preliminarily
- first approach to multi-threading
- similar to producer-consumer pattern

# Force Calculation:

- all particle pair combinations needed
- making use of Fij = -Fji

$$F_i = \sum_{j=1, j\neq i}^{\#particles} F_{ij}$$

| P | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **0** | **x** | ✔ | ✔ | ✔ | ✔ | ✔ |
| 1 | ✔ | x | **...** | | | |
| 2 | ✔ | | x | | | |
| 3 | ✔ | | | x | | |
| 4 | ✔ | | | | x | |
| 5 | ✔ | | | | | x |

# Sources:

- https://en.wikipedia.org/wiki/List_of_gravitationally_rounded_objects_of_the_Solar_System
- https://en.wikipedia.org/wiki/Halley%27s_Comet
- [image]https://allthatsinteresting.com/halleys-comet-1910
- slides meeting 1