

3. Semester report

by **Marcell Attila Mészáros** (marcellm@student.elte.hu)

PhD program: Astronomy and Space Physics

Supervisors: Tamás Kovács, Áron Süli

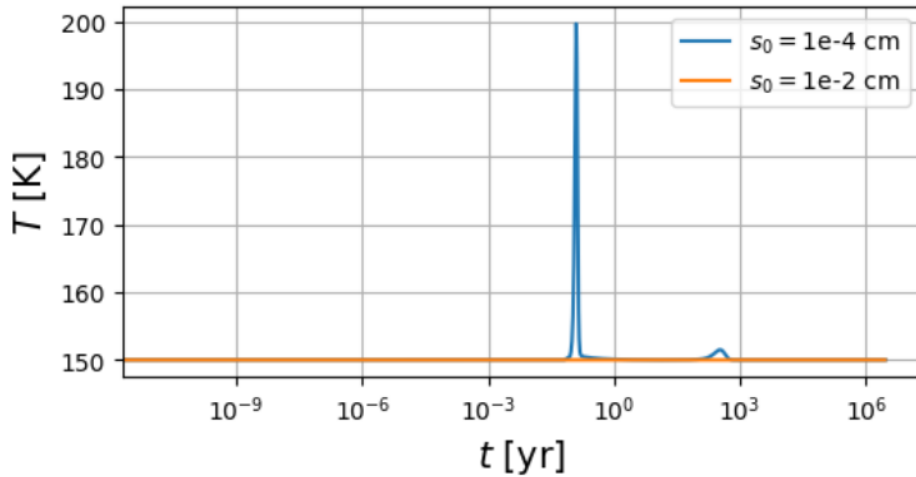
PhD Thesis Title: Dynamics and morphology of protoplanetary disks and galaxies

Description of research work carried out in current semester

I continued my work with my co-supervisor, Áron Süli, on the dust sedimentation and coagulation in protoplanetary disks. We wanted to investigate if the settling dust grains could melt due to friction and collisions, which might explain the creation of chondrules. The equation derived for the temperature change of the dust grain is the following:

$$\frac{dT}{dt} = \frac{v_{th}}{c\rho_m} \frac{1}{s} \rho(z) v_z^2 + \frac{3f}{8c\rho_m} \frac{1}{s} \rho(z) v_z^3 - \frac{3h}{c\rho_m} \frac{1}{s} (T - T_0) - \frac{3\varepsilon\sigma_{SB}}{c\rho_m} \frac{1}{s} (T^4 - T_0^4) + \frac{3fT_0}{4\rho_m} \frac{1}{s} \rho(z) v_z$$

This differential equation has to be solved alongside the ones for position and size numerically.



The conclusion is that the heat loss due to radiation is much greater than the gain, thus the dust particle does not reach melting temperature.

Publications

The first of the two articles we wish to publish in Fizikai Szemle is complete, and has been sent in for review. They replied that they would like to see the second part, so that they can decide whether to publish them in two parts or in one.

Teaching in current semester

I participated in the teaching of the Detection Methods in Astronomy 4 course.

Studies in current semester

In the third semester I signed up for 2 subjects:

- FIZ/5/033, Accretion processes in star formation (lecturer: Péter Ábrahám), grade: excellent (5)
- FIZ/5/055, Solar System plasma physics (lecturer: Andrea Opitz), grade: TBA