

Incorporating the "runaway greenhouse" phenomenon of extremely warm climates into the climate model of the educational software SimClimat.

The other planets of the solar system have very different climates from ours: their atmospheres does not have the same composition, their surfaces are not of the same type, the temperature and pressure are different, etc. The earth climate also was very different from today a few million years ago, and will change again in the future.

For the study of these extreme climates and other planets climates, computer models adapted from earth climate models are generally used.

The internship is based on the highly simplified climate model from the educational software SimClimat. This software is usually used to study a given range of earth climates, from extremely cold ("snowball" Earth) to current climate and hot climates. But it is not able to simulate an extremely hot climate in a realistic way.

For this internship, we will focus on the "runaway greenhouse" effect: this phenomenon appears when the temperature reaches a value around 1000°C , and describes the behavior of a planet emission to space at this temperature. The mechanisms at stake are very different from the ones currently leading our climate; this explains why the model equations must be adapted in order to simulate this phenomenon.



The main objective is that after this internship we could use the SimClimat software for planetology classes. Besides, in addition to the runaway greenhouse linked theory, the student will discover some aspects of climate modeling, especially of developing a model designed for an educational purpose. This implies to think about: (1) how to turn complex mechanisms into simple equations keeping a physical meaning, (2) why a given model works well only in a limited range of temperatures and how to remedy it, (3) how to guide the approach according to the model purpose (understanding, or reproducing).

