

User guide «C-model»

Introduction

The C-model application is designed to model local parameters of pelagic paleo-ecosystems based on data on the carbon isotopic composition of carbonates and conodont elements and the oxygen isotopic composition of carbonates.

Minimum hardware requirements:

Support for Python 3.10 interpreter with numpy, math, Matplotlib libraries

Application Features

Loading data from a text file.

Graphical output of initial data and simulation results.

Writing simulation results to a text file.

Working with the program

The program module works with the source data file in text format, without a header, with a comma separator. Initial data are presented for each section (sequence) in a separate file. The structure of the data file is as follows:

specimen position in the section (meters from the bottom of the section)(float), specimen identifier (char), conodont zone (char), conodont carbon isotope composition (‰, PDB)(float), taxon name (char), carbonate carbon isotopic composition (‰, PDB)(float), carbonate oxygen isotopic composition (‰, SMOW)(float)

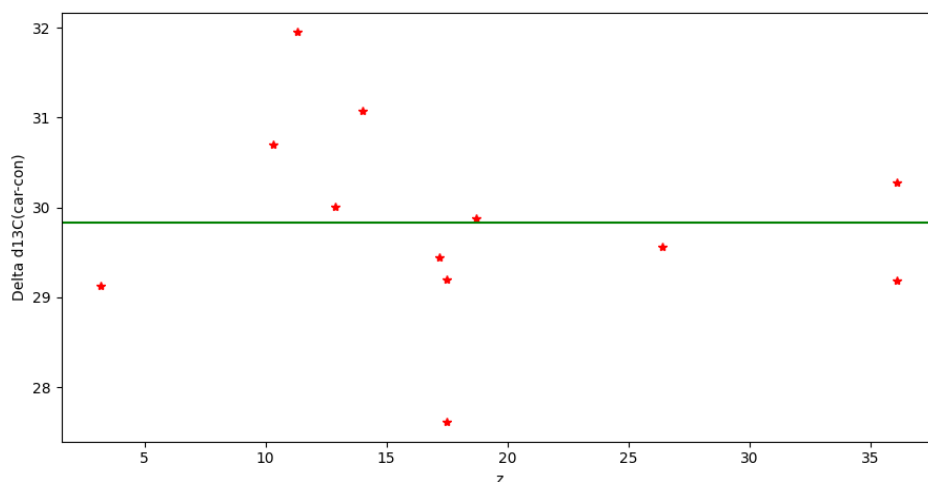
Upon startup, the software module requests the following information:

data file name (path/file name with extension)

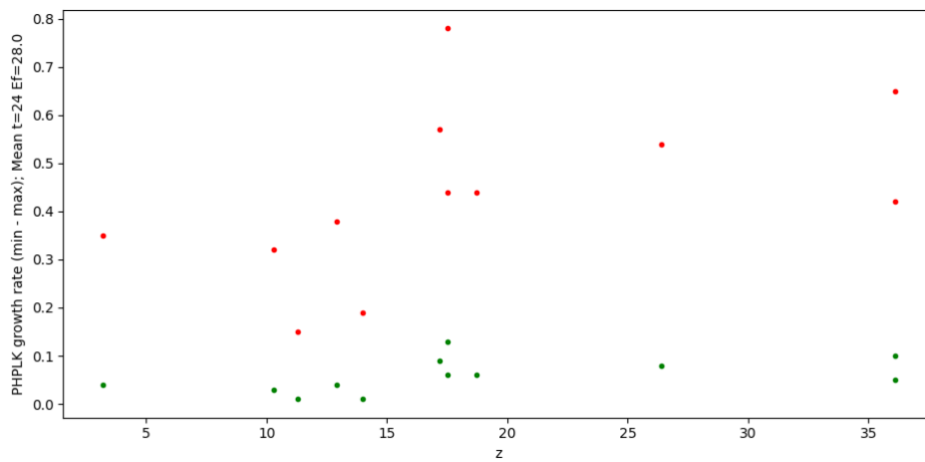
estimated isotopic composition of water (‰, SMOW)(-3 to 4)(float)

estimated fractionation of carbon isotopes during photosynthesis by primary producers (from 25 to 34‰)(float)

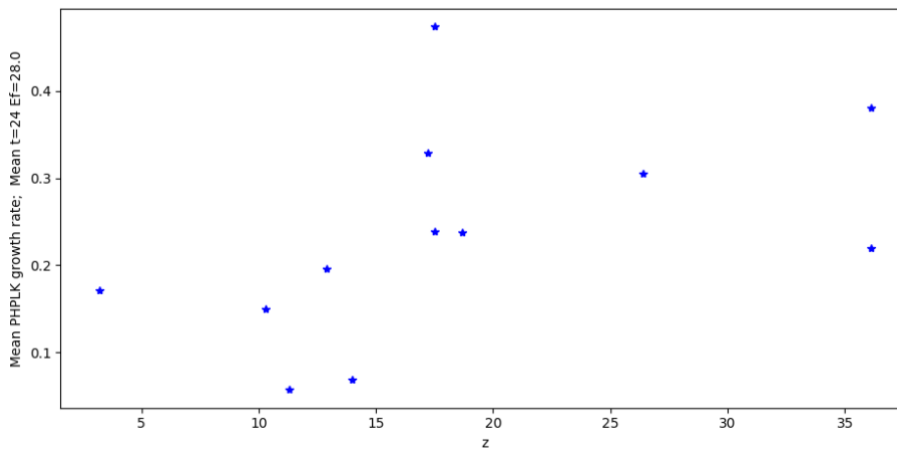
After entering the data, the following information is sequentially displayed on the screen in graphical form:



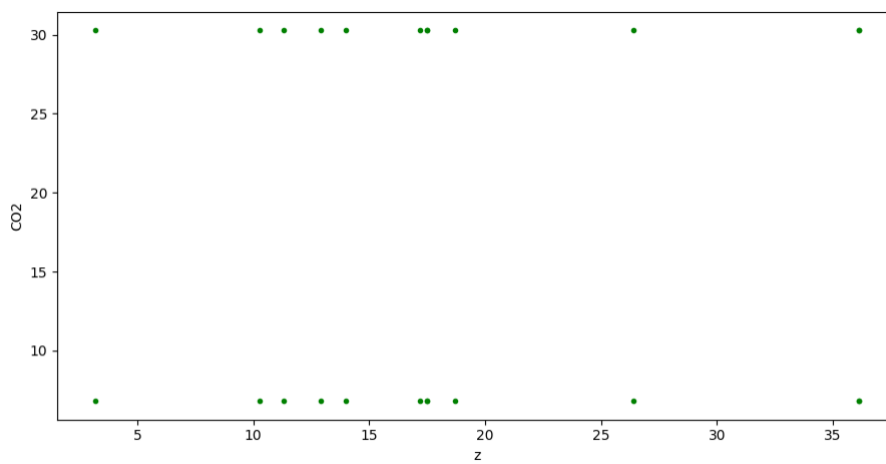
Distribution of the decouplet carbon isotopic composition of carbonates and conodonts along the section.

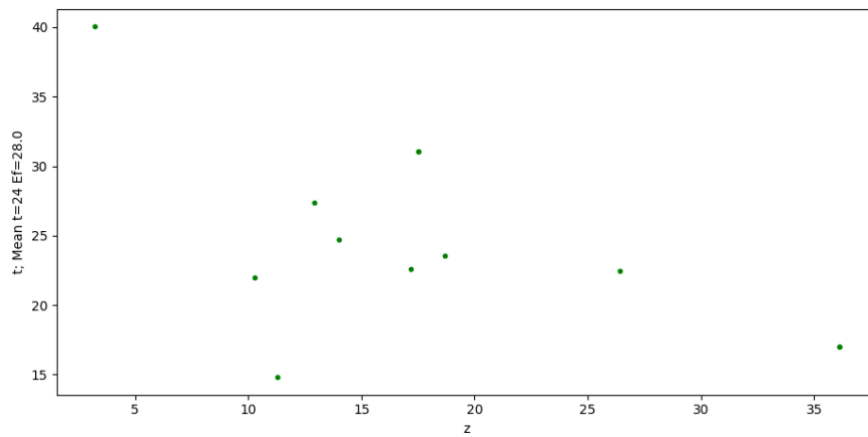


Distribution of the reconstructed phytoplankton growth rate along the section (maximum and minimum values)

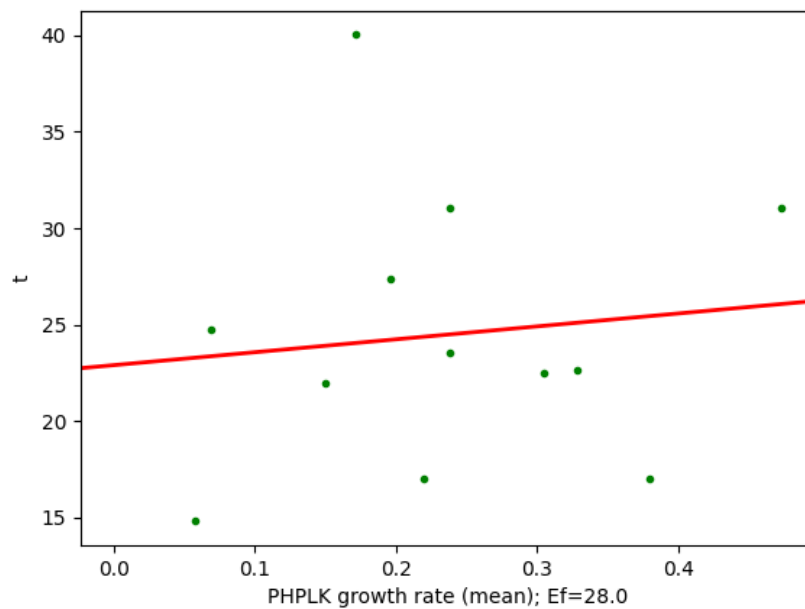


Distribution of the reconstructed phytoplankton growth rate along the section (average value)

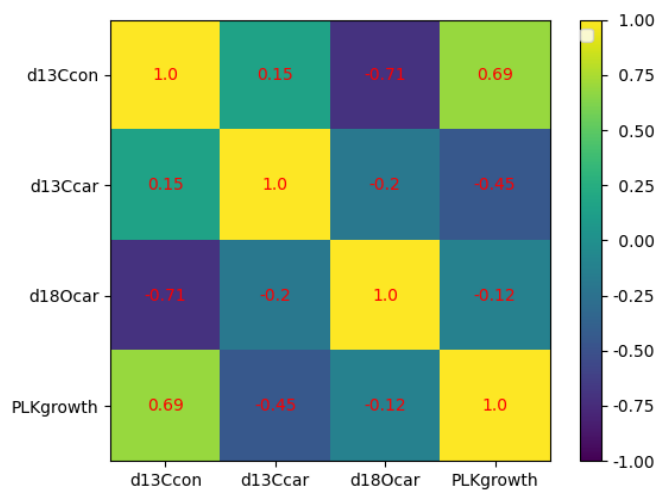




Distribution along the section of the reconstructed water temperature



Graph of the ratio of the average growth rate of phytoplankton and temperature



Correlation matrix with Pearson correlation coefficients (phytoplankton growth rate, oxygen and carbon isotopic composition of carbonates and carbon of conodonts)

Next, the program module requests the name of a text file to display the results. The structure of the output file (separated by commas, the first line contains headers):
specimen position in the section (meters from the bottom of the section)(float), conodont zone (char), specimen identifier (char), taxon name (char), conodont carbon isotope composition (‰, PDB)(float), carbonate carbon isotopic composition (‰, PDB)(float), carbonate oxygen isotopic composition (‰, SMOW)(float), carbon isotopic difference between carbonates and conodonts (‰, PDB)(float), phytoplankton growth rate is minimal (1/day)(float), phytoplankton growth rate is maximum (1/day)(float), phytoplankton growth rate is average (1/day)(float).