Getting started using CGT

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1 What you need to start

You should download the following things from `http://www.ergom.net`:

- A formal model description (textfiles): ERGOM IOW Baltic 1.0
- The two executables, for Windows or for Linux, depending on your operating system

  "cgt": The code generation tool

  "cgt_edit": An advanced editor for the textfiles
- code templates for the MATLAB 1-dimensional model, the zip file contains:
- in "/code_templates": the code templates themselves
- in "/code": some other matlab files which are needed to run the model. In this location, the final code will be generated.
- in "/code/init": initial data for running the 1d model
- in "/code/physics": physical data (temperature, turbulent diffusivity etc.) for running the 1d model

2 How to start

2.1 First things to do

- Unzip the zip files.
- Make sure all applications may write in the directory "code".

2.2 Getting to know the editor

- Run "cgt_edit" and choose to open an existing model.
- Choose "modelinfos.txt" from the textfiles directory and click "open".
- You will see a list of constants, tracers, processes etc. at the left.
- Click "processes" and select a process you like.
- Click "help" at the top right of the window. This will briefly show you what the different properties of the processes mean. Works the same for tracers, constants, ...
- Right-click a word which is highlighted in a color. This will make you jump to its definition.
- Click "back" (at top left) to return to where you were.
- Try to type something in the large textbox at the right-hand side. A "save" and a "cancel" button will appear. Click "cancel".
- Click one of the check boxes in the processes list. This determines whether or not the process will appear in the model output.
- Close the editor. Note that all changes you make are saved immediately, so before you change something, make a backup copy.

2.3 Creating your first model

- Run "cgt".
- Click "open modelinfos.txt" and load "modelinfos.txt" from the textfiles directory. Now the code generation tool loads the "textfiles" which contain the formal ecosystem model description.
- Click "..." after "code template path" and open any file in the code templates directory. All files in this directory will be used by the code generation tool.
- Click "..." after "output path" and open any file in the "code" directory.
- Click "save as default" at the left. This will make the code generation tool remember the directories you have chosen.
- Now click "generate code" and wait for 30 seconds or so. The Code Generation Tool will load all files in the code templates directory and preprocess them, filling in the information from the "textfiles". The resulting, finished code is then saved in the "code" directory. CGT will list all files which have been generated.
- Close CGT.

2.4 Running your first model

- Open Matlab.
- Go to the "code" directory.
- Open "configure.m" in the editor. Here you can define how long your model shall run.
- The forcing is only 1 year long. However, you can run n years with the same forcing by setting "repeated_runs" to n. Set it to 1.
- run "run.m"
- Wait. It takes long - about 2 days in a second on my computer. That's because MATLAB uses an interpreter and not a compiler. The same model created as a PASCAL code runs 20 times faster.
- Some day the model finishes and you get back the cursor. If you want a shorter run next time, change "end_date" in "configure.m".

2.5 Showing model results

- Type "myvar='t_lpp' ".
- Type "myplot". A window will open and show you the large-cell phytoplankton bloom.
- Type "myvar='t_det' ". Type "myplot".
- Type "mylevels=0:1e-7:1e-6". Type "myplot". The color range has changed now.
- Type "mylevels=20" to return to an automatic range.
- Type "who output*" to see the whole model output. If a variable "output_VAR" is in the list, typing "myvar='VAR' " and "myplot" will plot this variable.
- Note: "output_scalar_..." or "output_vector_..." are only temporary variables and not final output.

2.6 Notes on the model results

- There is no atmospheric deposition and no inflow from the sides. This is not realistic.
- Because no sediment transport enters from the sides, the water column will not turn anoxic, even in the long run.
- The initial conditions for the carbon-cycle model are crap. The DIC model works only technically, its results are wrong.

3 How to proceed

- A documentation of the code generation tool and its features can be found under `http://www.ergom.net`.
- When questions occur: send an email to hagen.radtke@io-warnemuende.de
- Training courses on cgt and cgt_edit can be offered if you want to use the code generation tool.