

## Exercises “Working with ICON”

Each group has to pass the solutions of problems 2 – 6 to the teaching assistants in written form. Show your simulation results to your teaching assistant. You have to explain your new code to one of us on Saturday.

### Exercise 1

#### Problem 1

Connect to mistral by

```
ssh -X mistral.dkrz.de
```

In `/work/mh1049/icon_course_2018`, create your working directory `<acct>`, e.g. `k206081`. Your working directory is then:

```
mistral.dkrz.de:/work/mh1049/icon_course/<acct>/
```

Copy the model source code by

```
cp ~/m218036/icon_course_2018/icon-aes.tar /work/mh1049/icon_course/<acct>/
```

into your folder in `/work/mh1049/icon_course/<acct>/`, untar, and compile it (the tar file will unfold into: `icon-aes`).

#### Problem 2

What would be  $n$  and  $m$  in  $r_n b_m$  for the original icosahedron with 20 cells? Show that for every resolution  $r_n b_m$ ,  $n \in \mathbb{N}$  and  $m \in \mathbb{N}_0$ ,  $N_{r_n b_m} = N_{r_{n'} b_0}$  with a certain  $n' \in \mathbb{N}$  and calculate  $n'$ .

#### Problem 3

Show that  $N_{r_n b_{m+m'}} = 4^{m'} N_{r_n b_m}$  and  $N_{r_2 b_m} = 20 \times 2^{2m+2}$  for every  $n \in \mathbb{N}$  and  $m \in \mathbb{N}_0$ . How many grid cells has ICON in  $r_2 b_5$ ,  $r_2 b_7$ ,  $r_2 b_9$ ? Calculate  $\Delta_{r_n b_m}$  and  $\Delta'_{r_n b_m}$ , respectively.

#### Problem 4

How many edges do you have in the resolution  $r_n b_m$ , how many vertices exist? Give an elementary derivation of the respective formulae without using Euler's formula and use them to calculate the number of edges and vertices for  $r_2 b_4$ .

#### Problem 5

Prove the formula for  $\Delta'''_{r_n b_m}$  (distance between two triangle centres).