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Exercise 5

Tutorial: (Exercise May 12th, 2020) and **Home** (until May 19th, 2020):

1. Modify your Fortran program for the predator-prey model with diffusion from the last exercise such that it reads the model parameters

   $$\alpha, \beta, \gamma, \delta, \lambda, \mu,$$

   the spatial parameters

   $$\kappa, N(\text{number of grid boxes}),$$

   and the parameters for the time settings

   $$t_0, T, \Delta t$$

   from the *namelist file* `predatorprey.nml` that you find in OLAT.

   A *namelist file* consists of one or more *namelists groups*. In the *namelist file*, each *namelist group* has the format

   ```
   &namelist-group-name
   variable-1-name = variable-1-value
   variable-2-name = variable-2-value
   ...
   \
   ```

   In the Fortran program, each *namelist group* has to be defined by

   ```
   namelist/ namelist-group-name/ variable1-name, variable-2-name, ...
   ```

   Then, the *namelist file* has to be opened for reading as described on the 3rd exercise sheet.

   Finally, each *namelist group* is read using

   ```
   read(unit,nml=namelist-group-name)
   ```

2. Make sure in your code that the condition $n \geq 2N^2\kappa T$ is always satisfied.

3. One way to accelerate a computation is working with reduced arithmetic precision.

   In OLAT, you find a module file `mod_precision.f90` where the working precision `wp` can be set to either single (`sp`) or double (`dp`) precision.

   In the code, the module is loaded directly at the beginning of a program or subroutine by

   ```
   use precision
   ```

   Real variables are then declared by

   ```
   real(kind=wp) :: ...
   ```

   The module file has to be compiled first. Afterwards, the remaining code that uses the module has to be compiled.

   Run your model code once with single and once with double precision. What runtime reduction can you achieve?