Tutorial 3: Handling netCDF files as downloaded from the KUMA system

In this tutorial we will work through a script that is handling a netCDF file. netCDF is a binary data format often used for scientific data storage, especially in environmental science like Oceanography or Meteorology. It`s advantage is that meta information can be attached to the actual data set, so that users have a better insight in the type of data they are working with. All data stored in KUMA are converted to netCDF.

Before we can start handling the files, we need to install the CRAN "ncdf" package in R. Go to "install packages", select a mirror and choose the "ncdf" package from the list. In order to load these specific functions from the ncdf library, the first thing we have to type in the R command window is

```
library("ncdf")
```

Now we can get started. The script we use is called "Handle_netCDF.R" and the file we will work with is called "EXAMPLE.nc". The latter is an original file from the KUMA system.

Task 1) Go through the function called "getusedto_netCDF" line by line. The comments in the script will lead you through it. It will show you how to open a netcdf file and to explore it`s content. Also, it shows how the values of a specific variable can be loaded and how to deal with the time dimension. The various steps will allow you to answer the following questions:

   a. How many variables are stored in the file?
   b. What is the name of variable number 5?
   c. Which time period is represented by the dataset?
   d. Which instrument was used for the observations?
   e. At which measurement site is the instrument located?

Now that you went through the script, you might be able to answer these questions by using the techniques learned so far.

   a. What is the name of variable number 1?
   b. What is the unit of variable number 5?
   c. Specify the location of the measurement site by giving longitude, latitude and height.
   d. What is the temporal resolution?
   e. Create a time series plot of barometric pressure (variable "press").

Task 2) If you want to retrieve all variables from a netcdf file, you could use the function "getnetCDF" which simply needs the name of the file as an input. The output is a list of two components, the first one has got the time axis the second one is made of a data matrix with all variables. Now use this function to retrieve the data and answer the following questions:

   a. What is the first time step in the file?
   b. What are the dimensions of the data matrix?