Proposal Tests

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Overview of project

The main goal of this project is to explore the environmental condtions of clearing events in Stratocumulus clouds over the Southeast Atlantic Ocean. This project will download reanalysis data from online, read in this data, find the correct fields to plot, and then plot said fields. Possible variables that will be examined includes pressure, potential temperature, wind, etc.

Function testing

The first function `ei_download` downloads European Reanalysis Interim (ERA-Interim) data from the European Centre for Medium-Range Weather Forecats (ECMWF) given desired dates for data and the file name for where the data is to be stored. The test for this data is not very thorough, it only tests if the data file exists. Please note that the functions used in the script below are provided by the ECMWF as they have created a nice Web-API package for Python users.

```
import os
import sys
sys.path.insert(0, "C:\\Users\\Laura\\Documents\\EVRN720\\tomkins_dcei\\UnitTesting\\")
startdate = '2018-01-01'
enddate = '2018-01-02'
date_str = startdate+'/to/'+enddate
data_path = 'interim_'+startdate+'to'+enddate+'.nc'
execfile('ei_download.py')
```

```
## 2018-04-09 18:21:10 ECMWF API python library 1.5.0
## 2018-04-09 18:21:10 ECMWF API at https://api.ecmwf.int/v1
## 2018-04-09 18:21:13 Welcome Laura Tomkins
## 2018-04-09 18:21:13 In case of problems, please check https://software.ecmwf.int/wiki/display/WEBAPI/
## 2018-04-09 18:21:13 In case of delays, please check  service activity page http://apps.ecmwf.int/weba
## 2018-04-09 18:21:15 Request submitted
## 2018-04-09 18:21:15 Request id: 5acbf56a1fd4727372e7cfc4
## 2018-04-09 18:21:15 Request is queued
## Calling 'nice mars /tmp/tmp-_marszMJdBq.req'
## mars - WARN -
## mars - WARN - From 9 February 2016 10AM (UTC) MARS uses versions of
## mars - WARN - libemos newer than 4.3.0. For more details, see
## mars - WARN - https://software.ecmwf.int/wiki/display/EMOS/Bug+fix+implemented+in+EMOSLIB+4.3.x
## mars - WARN -
## PPDIR is /var/tmp/ppdir/x86_64
## mars - INFO   - 20180409.232117 - Welcome to MARS
## mars - INFO   - 20180409.232117 - MARS Client build stamp: 20180219222651
## mars - INFO   - 20180409.232117 - MARS Client version: 6.20.2
## mars - INFO   - 20180409.232117 - EMOSLIB version: 4.5.3
## mars - INFO   - 20180409.232117 - Using ecCodes version 2.6.1
## mars - INFO   - 20180409.232117 - Using odb_api version: 0.15.6 (file format version: 0.5)
```

```
## mars - INFO   - 20180409.232117 - Maximum retrieval size is 30.00 G
## retrieve,levelist=300/500/600/700/800/850/900/950/1000,area=10/-35/-46/25,levtype=pl,number=all,para
## mars - INFO   - 20180409.232117 - Automatic split by date is on
##
## mars - INFO   - 20180409.232117 - Processing request 1
## mars - WARN   - 20180409.232117 - Area not compatible with grid
## mars - WARN   - 20180409.232117 - Area changed from 10/-35/-46/25 to 10.5/-35.25/-46.5/25.5
##
## RETRIEVE,
##     CLASS      = EI,
##     TYPE       = AN,
##     STREAM     = OPER,
##     EXPVER     = 0001,
##     REPRES     = SH,
##     LEVTYPE    = PL,
##     LEVELIST   = 300/500/600/700/800/850/900/950/1000,
##     PARAM      = 129/130/131/132/135/157/246/248,
##     TIME       = 0000/1200,
##     STEP       = 12,
##     DOMAIN     = G,
##     RESOL      = AUTO,
##     AREA       = 10.5/-35.25/-46.5/25.5,
##     GRID       = 0.75/0.75,
##     PADDING    = 0,
##     DATE       = 20180101/20180102
##
## mars - INFO   - 20180409.232117 - Web API request id: 5acbf56a1fd4727372e7cfc4
## mars - INFO   - 20180409.232117 - Requesting 288 fields
## mars - INFO   - 20180409.232117 - Calling mars on 'marser', callback on 54348
## mars - INFO   - 20180409.232117 - Server task is 106 [marser]
## mars - INFO   - 20180409.232117 - Request cost: 288 fields, 34.9869 Mbytes online, nodes: mvr12 [mar
## mars - INFO   - 20180409.232117 - Wind conversion requested by server
## mars - INFO   - 20180409.232118 - Transfering 36686376 bytes
## mars - WARN   - 20180409.232118 - INTFB: Resolution automatically set to  213
## mars - INFO   - 20180409.232118 - Deriving U and V from vorticity and divergence
## mars - WARN   - 20180409.232118 - INTUVU: Resolution automatically set to  213
## mars - INFO   - 20180409.232121 - 288 fields retrieved from 'marser'
## mars - INFO   - 20180409.232121 - 288 fields have been interpolated
## mars - INFO   - 20180409.232121 - Request time:  wall: 3 sec  cpu: 2 sec
## mars - INFO   - 20180409.232121 -   Read from network: 34.99 Mbyte(s) in < 1 sec [43.80 Mbyte/sec]
## mars - INFO   - 20180409.232121 -   Visiting marser: wall: 3 sec
## mars - INFO   - 20180409.232121 -   Post-processing: wall: 2 sec cpu: 2 sec
## mars - INFO   - 20180409.232121 -   Writing to target file: 3.17 Mbyte(s) in < 1 sec [284.03 Mbyte/s
## mars - INFO   - 20180409.232121 - Memory used: 51.45 Mbyte(s)
## mars - INFO   - 20180409.232121 - No errors reported
## Process '['nice', 'mars', '/tmp/tmp-_marszMJdBq.req']' finished
## Calling 'nice grib_to_netcdf /data/data01/scratch/_mars-atls19-98f536083ae965b31b0d04811be6f4c6-wg6D
## grib_to_netcdf: Version 2.7.0
## grib_to_netcdf: Processing input file '/data/data01/scratch/_mars-atls19-98f536083ae965b31b0d04811be
## grib_to_netcdf: Found 288 GRIB fields in 1 file.
## grib_to_netcdf: Ignoring key(s): method, type, stream, refdate, hdate
## grib_to_netcdf: Creating netCDF file '/data/data02/scratch/_grib2netcdf-atls17-a82bacafb5c306db76464
## grib_to_netcdf: NetCDF library version: 4.3.0 of Jul  3 2017 10:18:00 $
## grib_to_netcdf: Creating large (64 bit) file format.
```

```
## grib_to_netcdf: Defining variable 'z'.
## grib_to_netcdf: Defining variable 't'.
## grib_to_netcdf: Defining variable 'w'.
## grib_to_netcdf: Defining variable 'r'.
## grib_to_netcdf: Defining variable 'clwc'.
## grib_to_netcdf: Defining variable 'cc'.
## grib_to_netcdf: Defining variable 'u'.
## grib_to_netcdf: Defining variable 'v'.
## grib_to_netcdf: Done.
## Process '['nice', 'grib_to_netcdf', '/data/data01/scratch/_mars-atls19-98f536083ae965b31b0d04811be6f4
## 2018-04-09 18:21:23 Request is complete
## 2018-04-09 18:21:23 Transfering 3.47205 Mbytes into interim_2018-01-01to2018-01-02.nc
## 2018-04-09 18:21:23 From https://stream.ecmwf.int/data/atls17/data/data02/scratch/_grib2netcdf-atls1
## 2018-04-09 18:21:38 Transfer rate 244.02 Kbytes/s
```

```
dir_path = "C:\\Users\\Laura\\Documents\\EVRN720\\tomkins_dcei\\UnitTesting\\"
filename = "interim_"+startdate+"to"+enddate+".nc"
full_path = dir_path+filename
if os.path.exists(full_path):
  print('get_data test passed')
else:
  print('get data test failed')
```

```
## get_data test passed
```

The second function will be `get_variable` which extracts a certain variable from the data file obtained from ei_download. The test for this function tests to seeif the variable created exists.

```
import os
import sys
sys.path.insert(0, "C:\\Users\\Laura\\Documents\\EVRN720\\tomkins_dcei\\UnitTesting\\")
import get_variable as gv
startdate = '2018-01-01'
enddate = '2018-01-02'
date_str = startdate+'/to/'+enddate
data_path = 'interim_'+startdate+'to'+enddate+'.nc'
dir_path = "C:\\Users\\Laura\\Documents\\EVRN720\\tomkins_dcei\\UnitTesting\\"
filename = "interim_"+startdate+"to"+enddate+".nc"
full_path = dir_path+filename
test_var = gv.get_variable(full_path, "z")
if 'test_var' in locals():
  print('get_variable test passed')
else:
  print('get_variable test failed')
```

```
## get_variable test passed
```

The third function will be `plot_variable` which will plot the variables obtained in `get_variable`. Probable syntax: `plot <- plot_variable(variable, latitude_lims, longitude_lims)`. Most of the plots are likly to be spatial, hence the usage of latitude and longitude limits. Unsure of ways to test as present moment.

More functions are likely to be added in the process and current functions are likely to be edited/re-designed.