**Appendix**

GPR code is uploaded to Github

<https://github.com/JunfeiXia/GPR_NCOM/blob/main/GPR_example.py>

Input data requirement, .mat file which contains

Graphical user interface, text

Description automatically generated

20 is the number of drifters, 36 is the number of time-steps.

**Python environment**

Python 3.8

|  |  |  |
| --- | --- | --- |
| *ca-certificates* | *2020.12.5* |  |
| *cached-property* | *1.5.2* |  |
| *cached\_property* | *1.5.2* |  |
| *certifi* | *2020.12.5* |  |
| *cycler* | *0.10.0* |  |
| *decorator* | *5.0.9* |  |
| *freetype* | *2.10.4* |  |
| *gpy* | *1.10.0* |  |
| *h5py* | *3.2.1* |  |
| *hdf5* | *1.10.6* |  |
| *intel-openmp* | *2021.2.0* |  |
| *jbig* | *2.1* |  |
| *jpeg* | *9d* |  |
| *kiwisolver* | *1.3.1* |  |
| *krb5* | *1.19.1* |  |
| *lcms2* | *2.12* |  |
| *lerc* | *2.2.1* |  |
| *libblas* | *3.9.0* |  |
| *libcblas* | *3.9.0* |  |
| *libcurl* | *7.77.0* |  |
| *libdeflate* | *1.7* |  |
| *liblapack* | *3.9.0* |  |
| *libpng* | *1.6.37* |  |
| *libssh2* | *1.9.0* |  |
| *libtiff* | *4.3.0* |  |
| *lz4-c* | *1.9.3* |  |
| *m2w64-gcc-libgfortran* | *5.3.0* |  |
| *m2w64-gcc-libs* | *5.3.0* |  |
| *m2w64-gcc-libs-core* | *5.3.0* |  |
| *m2w64-gmp* | *6.1.0* |  |
| *m2w64-libwinpthread-git* | *5.0.0.4634.697f757* |  |
| *matplotlib-base* | *3.4.2* |  |
| *mkl* | *2021.2.0* |  |
| *msys2-conda-epoch* | *20160418* |  |
| *numpy* | *1.20.3* |  |
| *olefile* | *0.46* |  |
| *openjpeg* | *2.4.0* |  |
| *openssl* | *1.1.1k* |  |
| *paramz* | *0.9.5* |  |
| *pillow* | *8.2.0* |  |
| *pip* | *21.1.2* |  |
| *proj* | *8.0.0* |  |
| *pyparsing* | *2.4.7* |  |
| *pyproj* | *3.1.0* |  |
| *pyreadline* | *2.1* |  |
| *python* | *3.8.10* |  |
| *python-dateutil* | *2.8.1* |  |
| *python\_abi* | *3.8* |  |
| *scipy* | *1.6.3* |  |
| *setuptools* | *49.6.0* |  |
| *six* | *1.16.0* |  |
| *sqlite* | *3.35.5* |  |
| *tbb* | *2021.2.0* |  |
| *tk* | *8.6.10* |  |
| *tornado* | *6.1* |  |
| *vc* | *14.2* |  |
| *vs2015\_runtime* | *14.28.29325* |  |
| *wheel* | *0.36.2* |  |
| *wincertstore* | *0.2* |  |
| *xz* | *5.2.5* |  |
| *zlib* | *1.2.11* |  |
| *zstd* | *1.5.0* |  |

**Some Variables in the code, maybe helpful for reading**

NAD83: Projection Coordinate System;

x\_ori, y\_ori: location projected at the coordinate system

rearth: radius of earth in meters

x1,y1,x2,y2:

d: distance between two points (x1, y1), (x2, y2)

f, lon, lat, u\_sel, v\_sel, year, mo, da, hour, minute, time: information from drifter dataset

lont, latt, uob, vob, yr, mon, day, hr, mn, tom: processed for python

xob2\_0, yob2\_0: (lont, latt) projected to NAD86

X: [tob, yob, xob];

LL: [tob,latt,lont];

obs: [vob,uob];

Xg: [TT,YY,XX];

YY,TT,XX = np.meshgrid(yg,tg,xg)

U0,V0,Ku0,Kv0: model prediction

xg0, yg0: reshape of Xg

Figure output: xg0,yg0,U0,V0,xob0,yob0,

**Model package: GPy**

<https://github.com/SheffieldML/GPy>