Department of Atmospheric Sciences
National Central University
Advanced Applied Mathematics
Homework V
2021/11/10-2021/11/26

Homework Description:

A 2-D wind field will be sent to you. The data are located on an Arakawa A grid point system, meaning all variables are located at the same grid point. Please do the following:

(1) Check the magnitude of the averaged divergence. You can use the root-mean-square magnitude.

(2) Plot the wind field.

(3) Use the "correct" scheme to variationally adjust the wind field under **strong constraint**, so that the final wind field becomes completely incompressible**. Please repeat this problem twice using "single-precision" and "double-precision" for your computer code, respectively.**

(4) Compute the magnitude of the averaged divergence again after the adjustment.

(5) Plot the wind field after the adjustment.

(6) Repeat (3) to (5), but use the "wrong" and yet more accurate scheme.

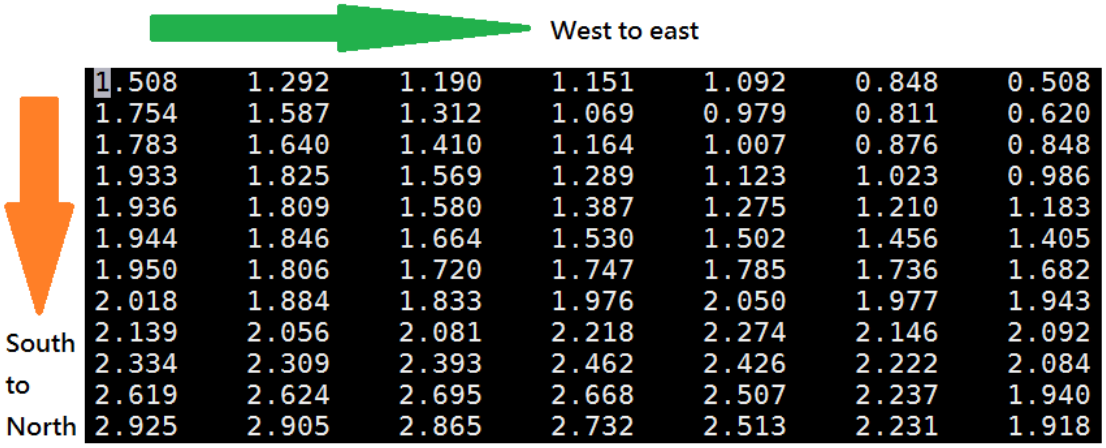
P.S.

(1) Submit both the results and the computer codes.

(2) Pay attention to the starting point where you begin to compute the divergence.

Data structure and format:

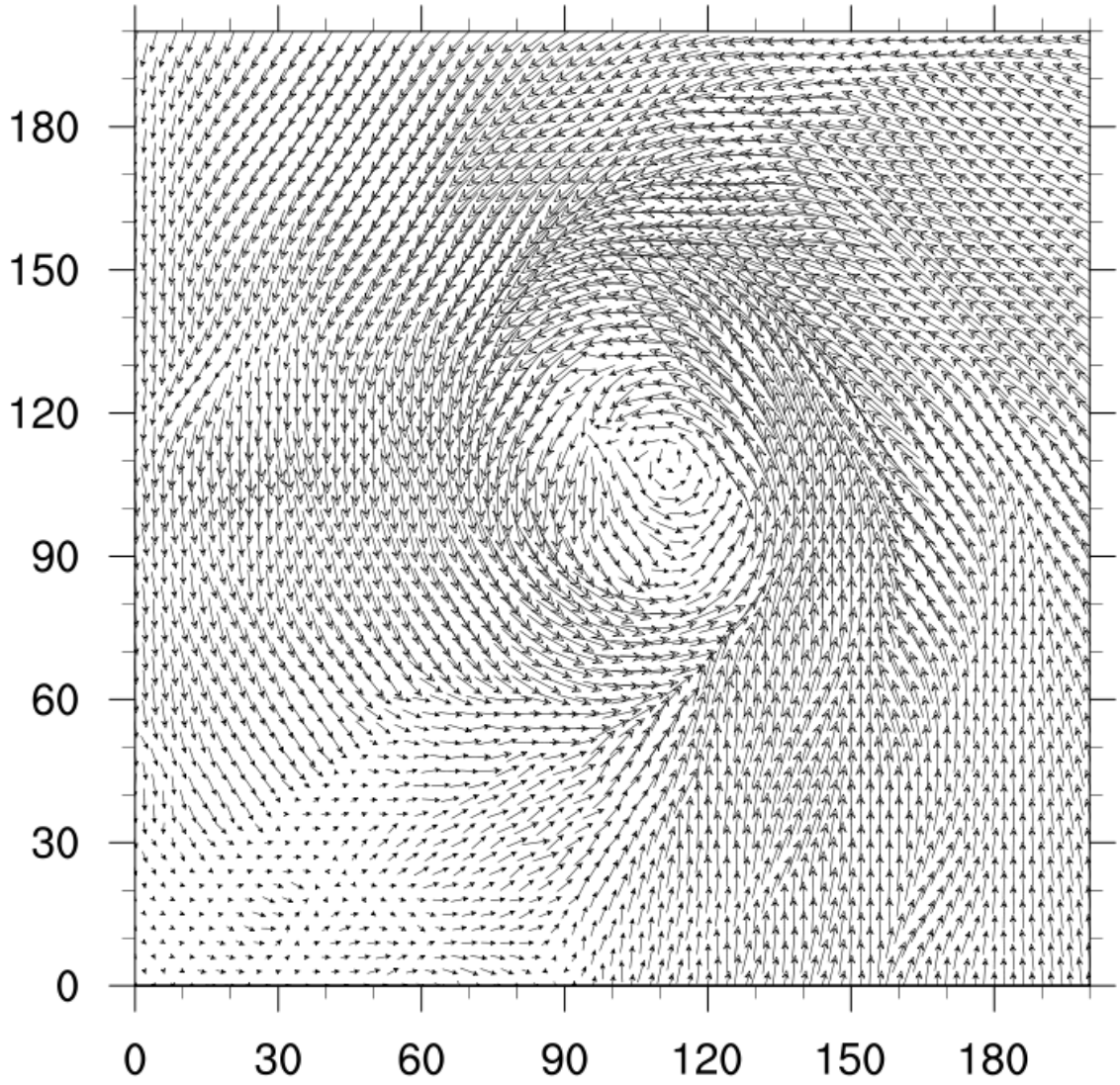
The data.txt contains u component and v component of wind field whose dimension is 51x51. The data dimension in the file is 402x201. The first 201x201 block is u, and the last 201x201 block is v, and the arrangement of each variable is shown in following picture. Resolution of the grid space is 2.0 km.



To read it using Fortran, for example, the code looks like this.

```
========== program to read data ===========
open(11,file='data.txt')
read(11,*) ((u(i,j),i=1,201),j=1,201)
read(11,*) ((v(i,j),i=1,201),j=1,201)
close(11)
==========       end program      ===========
```

If you read it successfully, the result should look like the following figure. Then, you can proceed to the computations listed in the **Homework Description:**


180
150
120
90
60
30
0
0
30
60
90
120
150
180