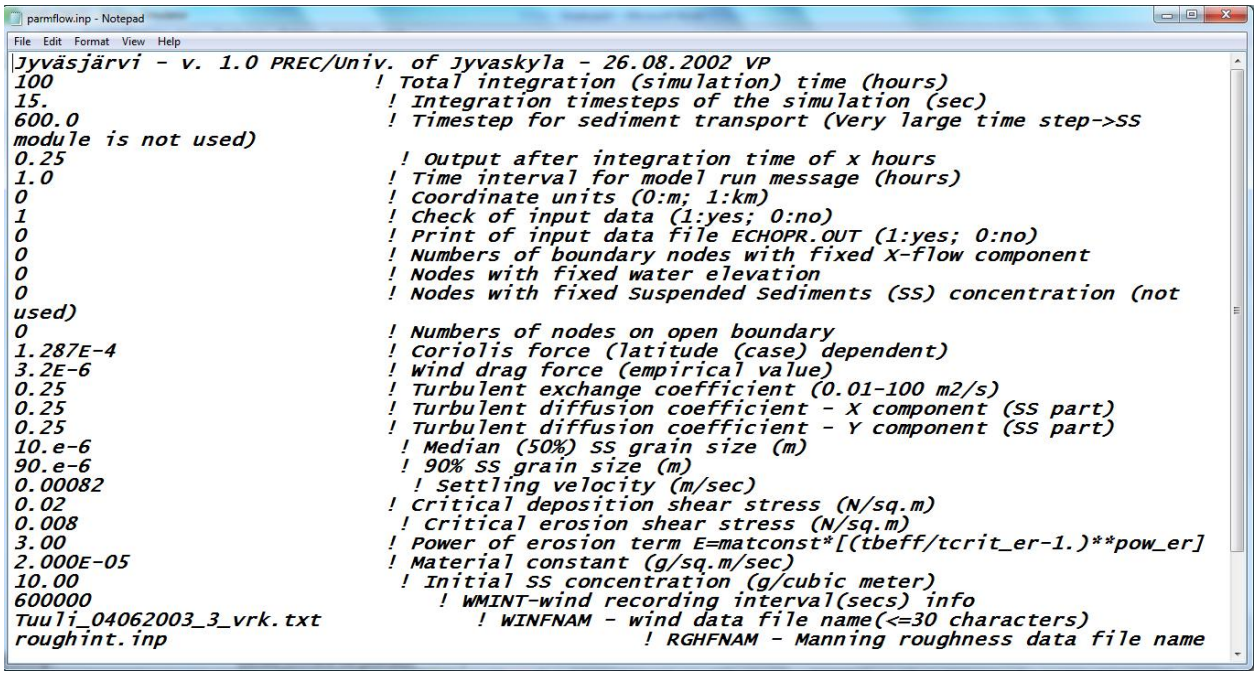
21.11.2016

Timo Huttula; Course on: Modeling in aquatic environment

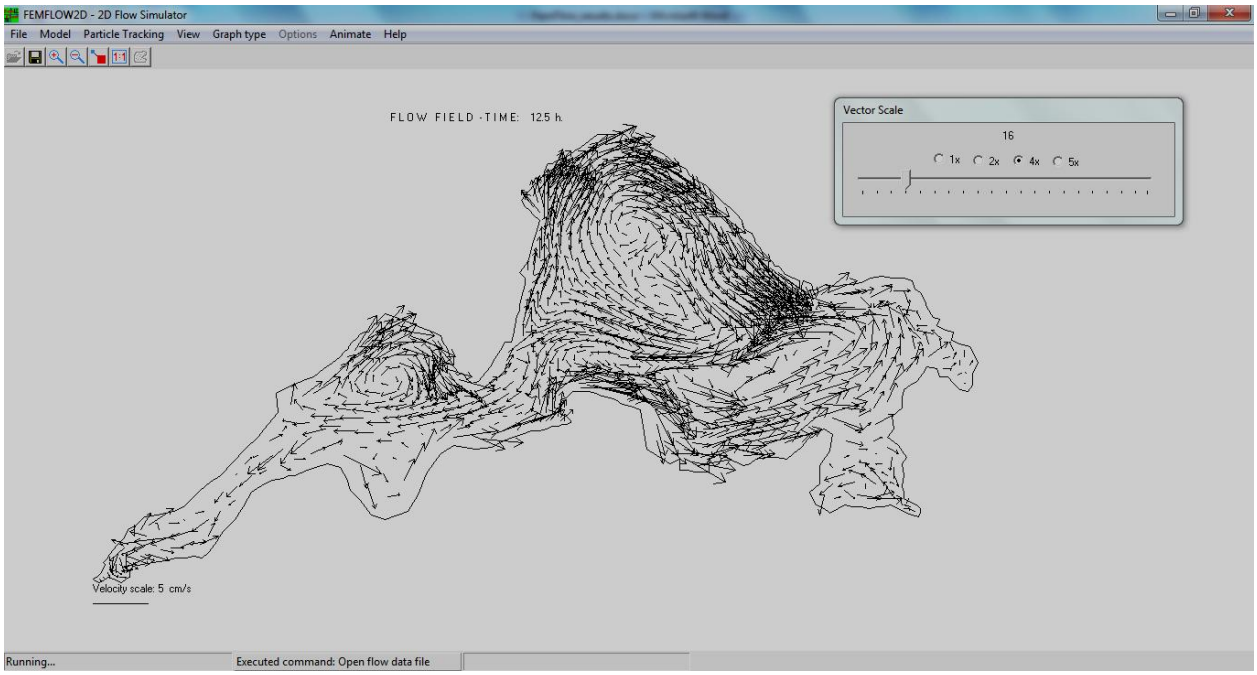
Exercise 3: Question 4

Here we study water circulation results in Lake Jyväsjärvi at different latitudes by changing the Coriolis parameter.

Parameter values are as follows.



West wind 5 m/s.



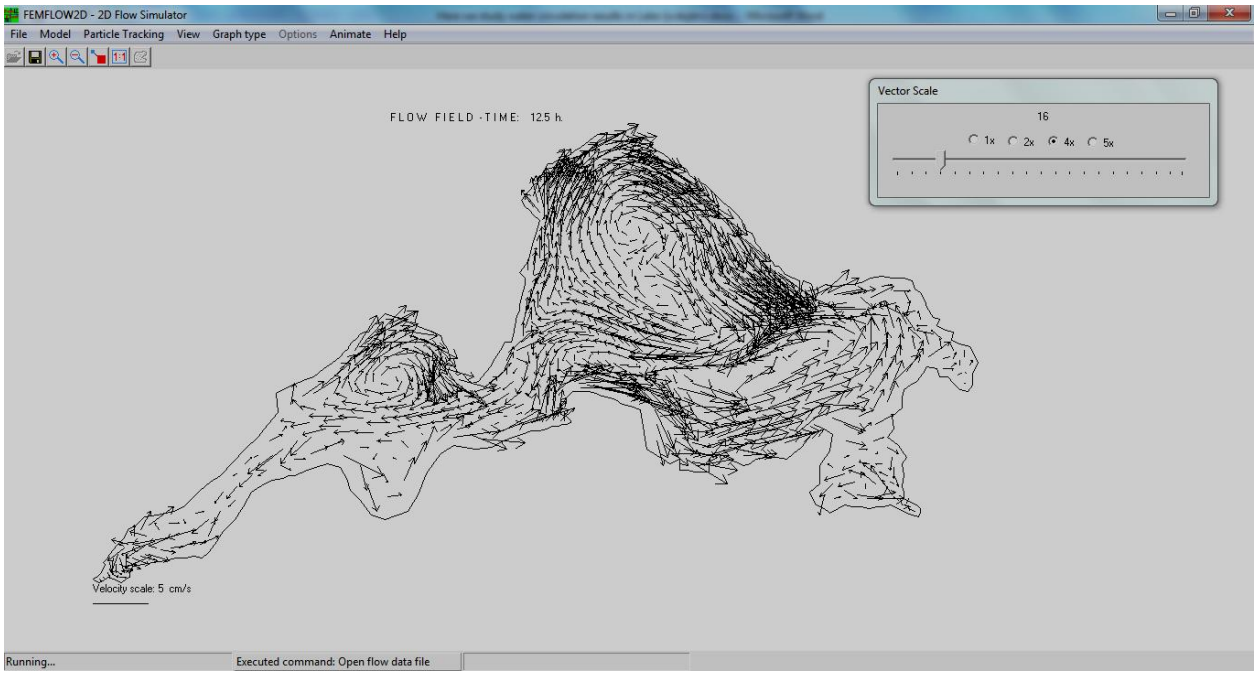
The Coriolis parameter is latitude dependent. In the case of Jyväsjärvi the latitude is 62.2 N. Let's move the lake on the Okayama latitude (34.6 N) and see what happens. For parameter calculation we can use http://www.physocean.icm.csic.es/Utilities/calculators/coriolis-en.html . The value of Coriolis parameter is now 0.826 E-04. So the parameter values are as follows:

parmflow.inp - Notepad

File Edit Format View Help

```
Jyväsjärvi - v. 1.0 PREC/Univ. of Jyvaskyla - 26.08.2002 VP
100                              ! Total integration (simulation) time (hours)
13.                               ! Integration timesteps of the simulation (sec)
600000.0                            ! Timestep for sediment transport (Very large time step->SS
module is not used)
0.25                               ! Output after integration time of x hours
1.0                               ! Time interval for model run message (hours)
0                                 ! Coordinate units (0:m; 1:km)
1                                 ! Check of input data (1:yes; 0:no)
0                                 ! Print of input data file ECHOPR.OUT (1:yes; 0:no)
0                                 ! Numbers of boundary nodes with fixed X-flow component
0                                 ! Nodes with fixed water elevation
0                                 ! Nodes with fixed Suspended Sediments (SS) concentration (not
used)
0                                 ! Numbers of nodes on open boundary
0.826E-4                          ! Coriolis force (latitude (case) dependent)
3.2E-6                            ! Wind drag force (empirical value)
0.25                              ! Turbulent exchange coefficient (0.01-100 m2/s)
0.25                              ! Turbulent diffusion coefficient - X component (SS part)
0.25                              ! Turbulent diffusion coefficient - Y component (SS part)
10.e-6                             ! Median (50%) SS grain size (m)
90.e-6                             ! 90% SS grain size (m)
0.00082                             ! Settling velocity (m/sec)
0.02                              ! Critical deposition shear stress (N/sq.m)
0.008                              ! Critical erosion shear stress (N/sq.m)
3.00                              ! Power of erosion term E=matconst*[(tbeff/tcrit_er-1.)**pow_er]
2.000E-05                         ! Material constant (g/sq.m/sec)
10.00                              ! Initial SS concentration (g/cubic meter)
600000                               ! WMINT-wind recording interval(secs) info
Tuuli_04062003_3_vrk.txt                ! WINFNAM - wind data file name(<=30 characters)
roughint.inp                                  ! RGHFNAM - Manning roughness data file name
```

Simulation result is here:



Q4: Do you see any difference in the flow field in the lake on these different latitudes? If yes, then why. If not, then why?

Q5: In what kind of lake the Coriolis effect would be quite obvious?