2D Squall Line demonstration (Part 1)

* 2D squall line demonstration preliminaries

$ salloc1
$ lab
$ mkdir SQUALL
$ cd SQUALL
$ cp ../../SQUALL/SETUP.tar .
$ tar --xvf SETUP.tar
• this unpacks 10 files: namelist.input, input_sounding, make_all_links.csh, reflec.gs,
  • control_file.subset, control_file.all, uthetap.gs, wthetap.gs, wdiabatic.gs,
  • squall_ensemble.gs
$ csh make_all_links.csh

* A 6-h simulation using the Purdue Lin scheme

• The namelist.input file is configured to make a 6 h simulation using microphysics scheme #2, the Purdue Lin scheme, and hourly output. No editing at this time.

$ srun ideal.exe
$ srun time wrf.exe

• This will result in a line like this, following, after SUCCESS COMPLETE WRF
  • 194.00 user 0.48system 3:15.28elapsed 99%CPU (0avgtext+0avgdata...

• Now use wrf_to_grads to create a GrADS output file. Use control_file.all

$ wrf_to_grads  control_file.all  mp02all

> launch GrADS and open mp02all .ctl.  These are all GrADS commands:

* execute the script reflec.gs.  This sets to final time (set t 7), and makes a color
* shaded plot of model estimated 10cm radar reflectivity field, and then PAUSES
* Only part of the domain is shown.

reflec.gs

* after you hit return, it superimposes the horizontal wind field with black contours
* look at this plot

<hit return>
* The script uthetap.gs plots horizontal wind (shaded) and perturbation potential
temperature for the final time
* Perturbation potential temperature is defined at the initial time at the left corner
uthetap.gs

* The script wthetap.gs plots vertical velocity (shaded) and perturbation theta
wthetap.gs

* The script wdiabatic.gs plots diabatic heating (K/h) on vertical velocity
* Diabatic heating due to microphysics is field h_diabatic
wdiabatic.gs

* The Purdue Lin scheme predicts cloud, rain, ice, snow and graupel, called
* QCLOUD, QRAIN, QICE, QSNOW, and QGRAUP
  • Pause between each sequence so you can see what’s been added
clear
set black 0 0
set cint 0.5
d 1000*qcloud
set black 0 0
set cint 0.5
d 1000*qrain
set black 0 0
set cint 0.1
d 1000*qice
set black 0 0
set cint 0.1
d 1000*qsnow
set black 0 0
set cint 0.3
d 1000*qgraup
Let's sum up the hydrometeor fields. “set clab off” turns off contour labeling

clear
set clab off
set cint 0.1
d $1000*(qcloud+qice+qrain+qsnow+qgraup)$

• Look at domain total hydrometeors by species, First compute air density

clear
set x 1
set t 1
set z 1 80
den = $(p*100)/(287.\cdot(tc+273.15))$
set t 1 7
set xaxis 0 6 1

• These are plotted from larger to smaller quantities

d tloop(sum(sum(den*qgraup,x=1,x=201),z=1,z=80))
d tloop(sum(sum(den*qrain,x=1,x=201),z=1,z=80))
d tloop(sum(sum(den*qcloud,x=1,x=201),z=1,z=80))
d tloop(sum(sum(den*qsnow,x=1,x=201),z=1,z=80))
d tloop(sum(sum(den*qice,x=1,x=201),z=1,z=80))

(end of Part 1)