Regression testing

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Outline

Covered in this lecture:

- additional documentation
- naming convention for regression tests
- run_test script
- compilers and MPI
- bugs and broken things

Additional documentation

- WAVEWATCH III® development best practices
  - NCEP website (v3.14): http://polar.ncep.noaa.gov/waves/wavewatch/wavewatch.shtml#documentation
  - In repository (v4, restricted access): {branch or trunk}/guide/report.pdf
- run_test wikis (restricted access):
  - https://svnemc.ncep.noaa.gov/trac/ww3/wiki/NrlTest
  - https://www7320.nrlssc.navy.mil/Alvin/index.php/WW3_Test_Cases

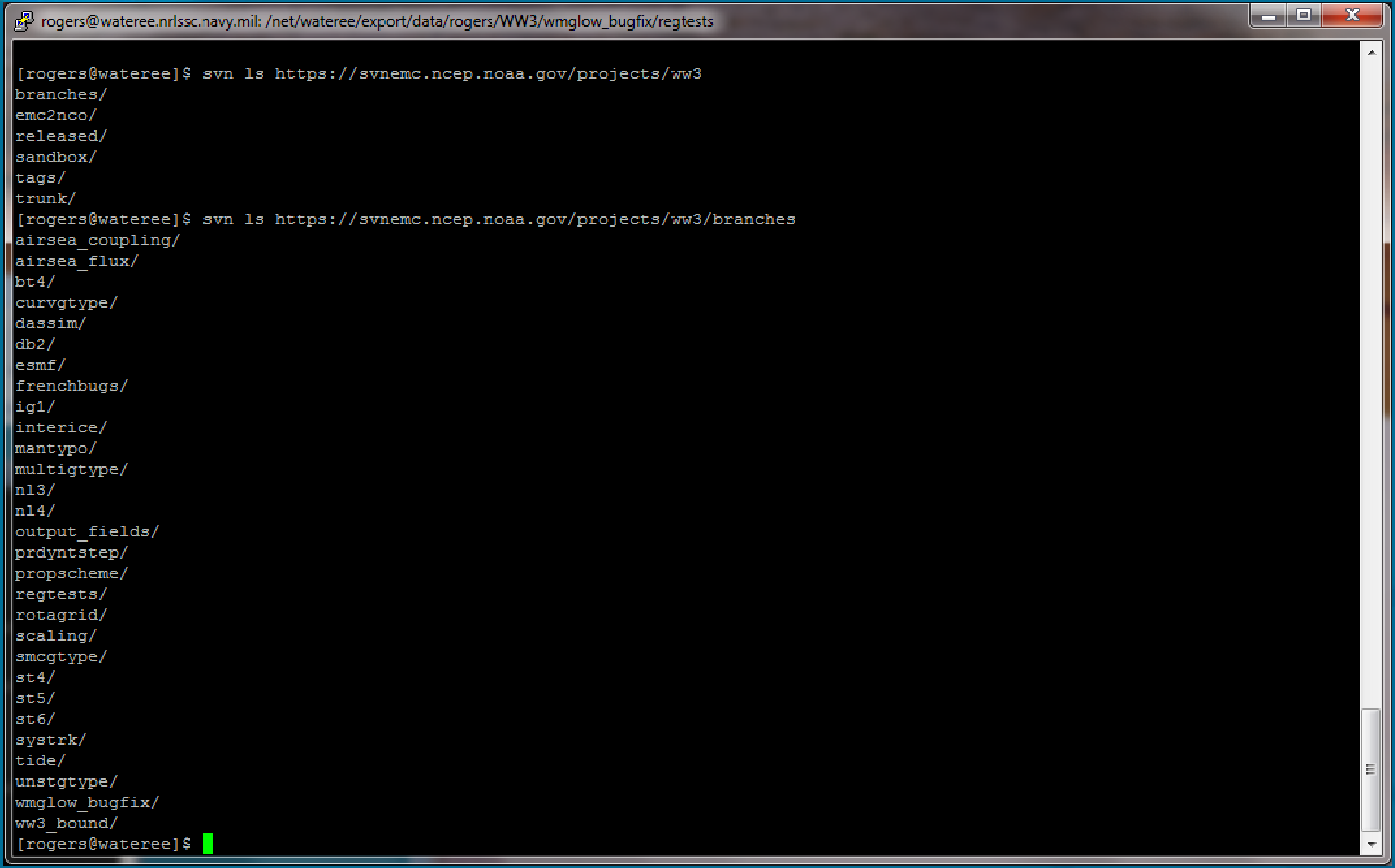
Test names

Naming conventions for test cases:

- ww3_tp1*N*: Tests for one-dimensional propagation
- ww3_tp2*N*: Tests for two-dimensional propagation
- ww3_tp3*N*: Tests for two-dimensional propagation in unstructured grids
- ww3_ts*N*: Tests of source terms
- ww3_tpsN: “realistic” tests with both propagation and source terms
- mww3_test*N*: simple tests for multi-grid wave model
- mww3_case*N*: “realistic” tests for multi-grid wave model

Note added by Erick Feb 12 2013 (after class ended) : Some content on this slide is not legible via projector. Prior to use in a subsequent class, the “screen grabs” should be converted to larger font powerpoint text boxes.

svn


rogers@wateree.nrlssc.navy.mil: /net/wateree/export/data/rogers/WW3/wmglow_bugfix/regtests

```
[rogers@wateree]$ svn ls https://svnemc.ncep.noaa.gov/projects/ww3
branches/
emc2nco/
released/
sandbox/
tags/
trunk/
[rogers@wateree]$ svn ls https://svnemc.ncep.noaa.gov/projects/ww3/branches
airsea_coupling/
airsea_flux/
bt4/
curvgtype/
dassim/
db2/
esmf/
frenchbugs/
ig1/
interice/
mantypo/
multigtype/
nl3/
nl4/
output_fields/
prdyntstep/
propscheme/
regtests/
rotagrid/
scaling/
smcgtype/
st4/
st5/
st6/
systrk/
tide/
unstgtype/
wmglow_bugfix/
ww3_bound/
[rogers@wateree]$
```

NCEP svn server

/regtests/

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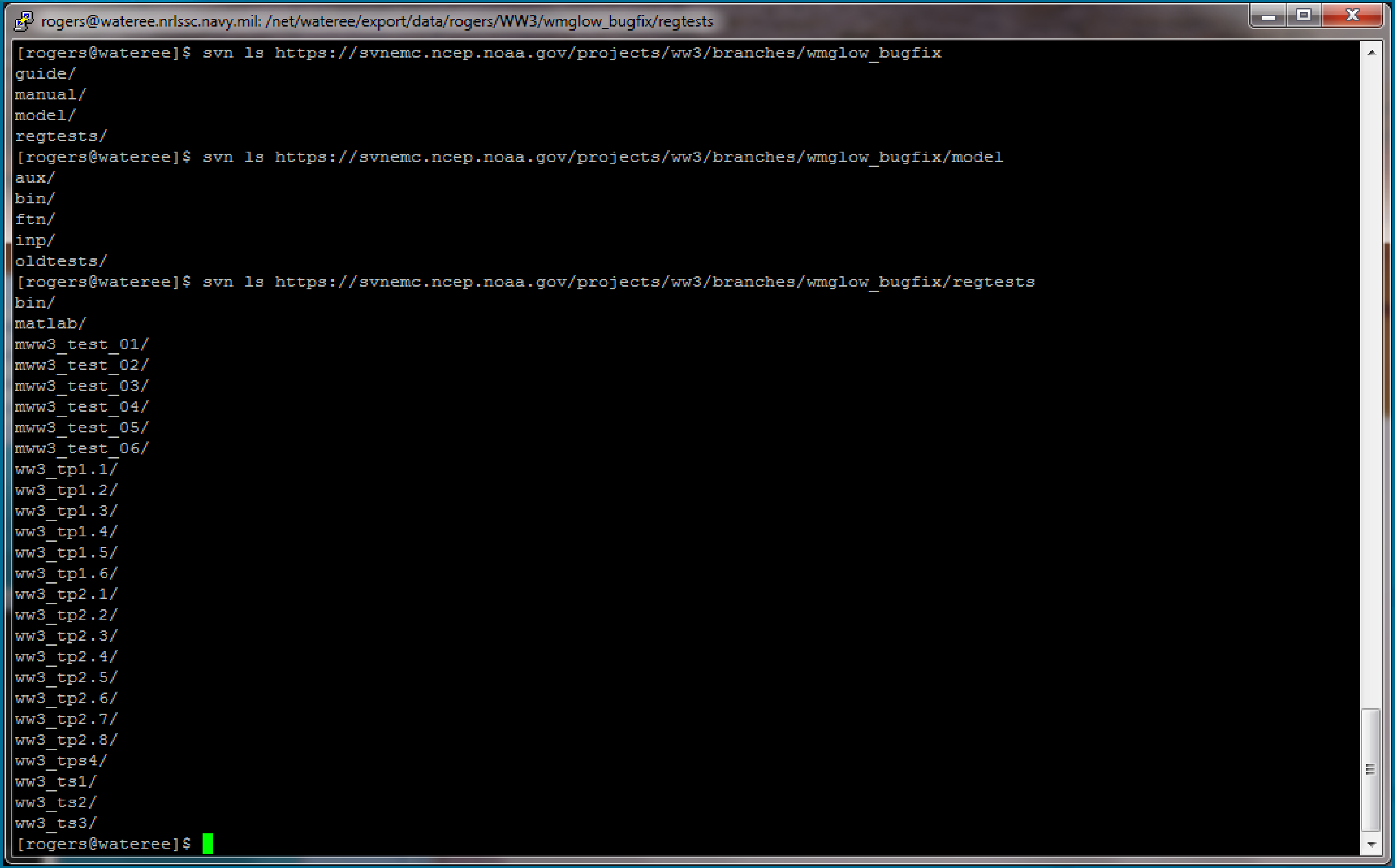

rogers@wateree.nrlssc.navy.mil: /net/wateree/export/data/rogers/WW3/wmglow_bugfix/regtests

```
[rogers@wateree]$ svn ls https://svnemc.ncep.noaa.gov/projects/ww3/branches/wmglow_bugfix
guide/
manual/
model/
regtests/
[rogers@wateree]$ svn ls https://svnemc.ncep.noaa.gov/projects/ww3/branches/wmglow_bugfix/model
aux/
bin/
ftn/
inp/
oldtests/
[rogers@wateree]$ svn ls https://svnemc.ncep.noaa.gov/projects/ww3/branches/wmglow_bugfix/regtests
bin/
matlab/
mww3_test_01/
mww3_test_02/
mww3_test_03/
mww3_test_04/
mww3_test_05/
mww3_test_06/
ww3_tp1.1/
ww3_tp1.2/
ww3_tp1.3/
ww3_tp1.4/
ww3_tp1.5/
ww3_tp1.6/
ww3_tp2.1/
ww3_tp2.2/
ww3_tp2.3/
ww3_tp2.4/
ww3_tp2.5/
ww3_tp2.6/
ww3_tp2.7/
ww3_tp2.8/
ww3_tps4/
ww3_ts1/
ww3_ts2/
ww3_ts3/
[rogers@wateree]$
```

regtests on NCEP svn server

run_test script introduction:

- shell script: *./regtests/bin/run_test*
  - *diff_ww3*, *run_suite*, *cleanup*, *run_cmp* provided in same directory: not covered here, but may also be useful
- each major test case occupies a directory, e.g. *./regtests/ww3_tp1.1/*
  - sub-types are available via multiple “run-time selectable” variants of *switch, ww3_multi.inp*, and *ww3_grid.inp* in *./regtests/{test name}/input/*
  - additional sub-types can be created by individual users
  - “run-time selectable” variants of *ww3_shel.inp*, *ww3_strt.inp*, *ww3_trck.inp*, *ww3_bound.inp* are not supported (yet), but users may customize them and/or use *cp* or *ln* to select variants
  - multiple variants of *ww3_outf.inp, ww3_ounf.inp, ww3_outp.inp, ww3_ounp.inp, ww3_prep.inp* exist. These are not “run-time selectable”: all existing variants are executed with every run.

If you have added a feature, you must also add a regression test (or sub-test) which utilizes your new feature

run_test script execution:

- execute without arguments (or with –h argument) for screen dump re: usage
- -c : change compiler (required on first use)
- -g : select a non-default grid (single grid cases)
- -i : select a non-default directory for input files
- -s : select a non-default switch file
- -w : use a non-default work directory
- -m : select grid set (multi-grid cases)
- -r : run only one program (e.g. *ww3_prep*)
- -q : quit after running program (e.g. *ww3_grid*)
- -n and –p : instructions for parallel runs
- -a and –e : select or modify *wwatch3.env* file
- -o select standard or NetCDF output

run_test script execution:

- running *run_test* for the first time in a "fresh" export/checkout of a branch:
  - *wwatch3.env* file will be created interactively*
  - "-c" must be used to set *comp* and *link* files*
- most *run_test* arguments are optional (i.e. defaults exist)
  - exception: multi-grid case require "-m"
  - "-s" is needed if file with default name */{test name}/input/switch* does not exist
- example commands:
  - *./bin/run_test -s ST1 ../model/ ww3_ts1*
  - *./bin/run_test -m grdset_a -n 3 -p mpirun -s PR3_MPI_SCRIP -w work_a_PR3_MPI_SCRIP ../model mww3_test_03*

* if not done manually

When to perform regression testing:

- after major changes to your branch
  - thorough set of tests needed
- prior to merge from your branch to trunk
  - thorough set of tests needed
- after minor/incremental change to your branch
  - usually a single regression test is enough

Which regression tests to use:

Common sense applies. Examples:

- if you are adding a new dissipation term, then you probably didn’t break the propagation (lower priority to test)
- if you are modifying NL1 code, you should check impact on all source term packages (ST1, ST2, etc.) (higher priority to test)

How to use results:

- verify that test runs to completion
  - this is sufficient to catch most problems
- however, if you have reason to worry (e.g. if you have made major changes)
  - run earlier version of code, and verify that differences are expected (non-graphical method: can use “diff” on the work directories), or
  - visualize results, or
  - both of the above

compilers and MPI

Compilers:

- Developers should occasionally test with an alternate compiler
- This is *much* more critical than you might expect.
- *Everyone* should include gfortran in their testing (since it’s free, you don’t have a good excuse not to...)

MPI:

- Developers should test with MPI prior to any merge to trunk
- This can be done on a workstation
- Rule applies even if your changes have no obvious connection with MPI

More machines, more compilers, more eyeballs ➔ more likely to find problems

Bugs and otherwise broken code

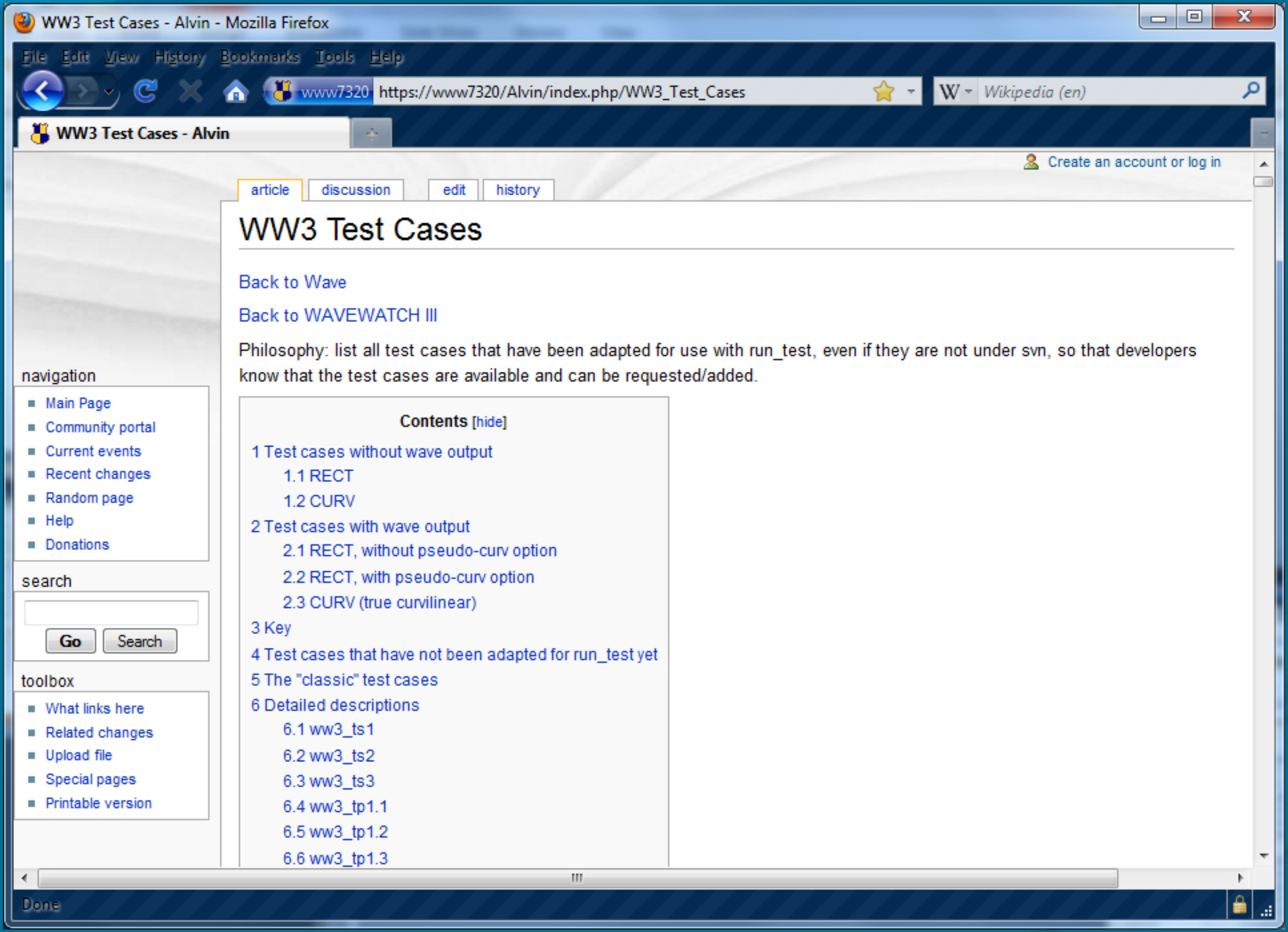
- Find bugs early via *run_test*, ideally, before you commit to repository
  - bugs found late create version-control nightmares
- If you find out too late that your code is broken:
  - halt all unrelated development in this branch until problem is fixed
  - if bug remains unresolved, you may want to back out the problem revision, or split off a new branch from a prior bug-free revision
- Think ahead: If you have the (good) habit of checking in revisions in small increments, this will make it easier to find out when/where/why code became broken.
  - brute force method: combine “svn export” with “run_test” to identify revision

What to do if you think that the code is broken

- If the problem is in your branch only
  - make sure that it doesn't get merged to trunk
  - work with your branch's dev team to fix it
- If the problem is more general
  - Notify the "trunk authorities". At time of writing, this is H. Alves. Do *not* complain to a 3rd party and expect him/her to notify the authorities.
  - Create/identify a test case that can be executed with *run_test* which exhibits the problem. If you created a new test case, check it into the repository. (In some cases, it may be best to create a new branch for this. There is also a "regtests" branch that can be used.)
  - Open a ticket (or help trunk authorities to do so). Include the *run_test* command in the ticket documentation.

The end

End of lecture



WW3 Test Cases - Alvin - Mozilla Firefox
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Wikipedia (en)
WW3 Test Cases - Alvin
Create an account or log in
article discussion edit history

WW3 Test Cases

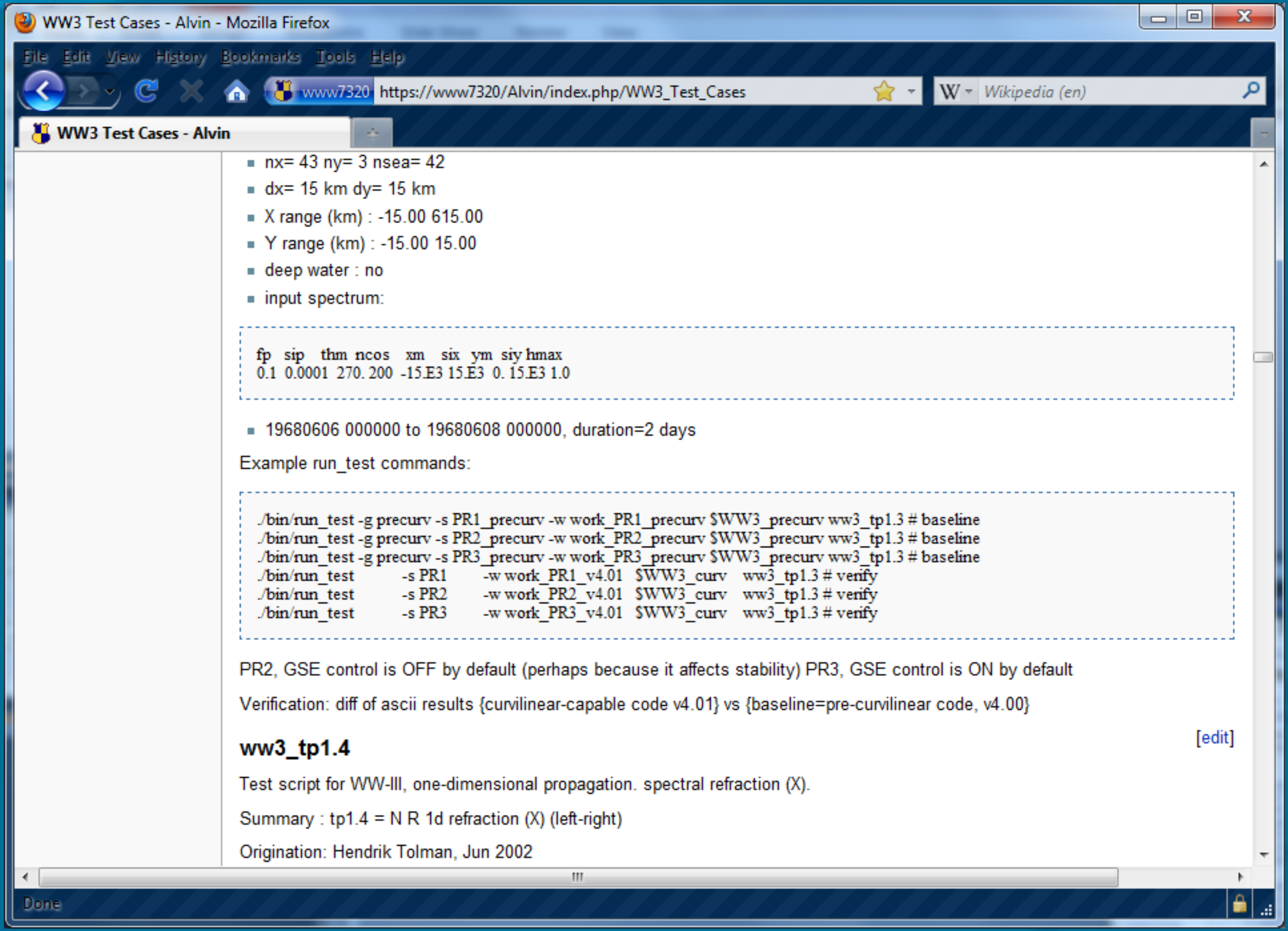
Back to Wave

Back to WAVEWATCH III

Philosophy: list all test cases that have been adapted for use with run_test, even if they are not under svn, so that developers know that the test cases are available and can be requested/added.

Contents [hide]

NRL wiki re: run_test cases


WW3 Test Cases - Alvin - Mozilla Firefox
File Edit View History Bookmarks Tools Help
www7320 https://www7320/Alvin/index.php/WW3_Test_Cases
Wikipedia (en)
WW3 Test Cases - Alvin
Done

- nx= 43 ny= 3 nsea= 42
- dx= 15 km dy= 15 km
- X range (km) : -15.00 615.00
- Y range (km) : -15.00 15.00
- deep water : no
- input spectrum:

```
fp   sip    thm  ncos   xm    six   ym  siy hmax
0.1  0.0001  270. 200  -15.E3 15.E3  0. 15.E3 1.0
```

- 19680606 000000 to 19680608 000000, duration=2 days

Example run_test commands:

```
./bin/run_test -g precurv -s PR1_precurv -w work_PR1_precurv $WW3_precurv ww3_tp1.3 # baseline
./bin/run_test -g precurv -s PR2_precurv -w work_PR2_precurv $WW3_precurv ww3_tp1.3 # baseline
./bin/run_test -g precurv -s PR3_precurv -w work_PR3_precurv $WW3_precurv ww3_tp1.3 # baseline
./bin/run_test          -s PR1        -w work_PR1_v4.01   $WW3_curv    ww3_tp1.3 # verify
./bin/run_test          -s PR2        -w work_PR2_v4.01   $WW3_curv    ww3_tp1.3 # verify
./bin/run_test          -s PR3        -w work_PR3_v4.01   $WW3_curv    ww3_tp1.3 # verify
```

PR2, GSE control is OFF by default (perhaps because it affects stability) PR3, GSE control is ON by default

Verification: diff of ascii results {curvilinear-capable code v4.01} vs {baseline=pre-curvilinear code, v4.00}

ww3_tp1.4

[edit]

Test script for WW-III, one-dimensional propagation. spectral refraction (X).

Summary : tp1.4 = N R 1d refraction (X) (left-right)

Origination: Hendrik Tolman, Jun 2002

NRL wiki re: run_test cases