Pre- and post-processing for 2D compound flooding study

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Building SCHISM package

- Required modules
  - FORTRAN/C compiler (serial): e.g. ifort, icc
  - FORTRAN/C compiler (parallel): e.g. mpif90, mpicc, mpiifort
  - Netcdf library
    - Often the main hurdle for build
    - Version 4.3+, serial
    - Split of FORTRAN and C libs – need both (some systems combine them into 1 location for you)
  - Perl, python: for creating dependency and culling
- make
- cmake

Pre-processing

- Mesh generation: SMS, …
  - Conversion from .2dm to .gr3 (.pl)
- ASCII inputs
  - Text editor: param.nml, bctides.in, vgrid.in …
  - ACE tool (xmgredit5): .gr3, .ic, .prop (CFL, skewness…)
  - Scripts
    - Mesh operations (merging, interpolation …)
    - Source/sink (ASCII): source_sink.in, vsource.th, vsink.th, msource.th
    - Tides (➔bctides.in): FES2014, TPXO9,…
    - .gr3: manning.gr3 (also try xmgredit5), elev.ic, split bad quads…
    - Vertical grid (LSC^2)
- Netcdf inputs: scripts
  - Atmospheric forcing (sflux/): CF 1.0 convention (structured grid product)
  - Sources and sinks: source.nc
  - i.c.: hotstart.nc
  - b.c.: *.th.nc
  - Tracer nudging: *_nu.nc
- There is a folder specifically for coupling scripts for NWM (Pre-processing/NWM/)

Post-processing

- Combination of outputs
  - Rank-specific 'raw' outputs (schout_0000_1.nc, schout_0000_1.nc) into global outputs (schout_1.nc): we are moving away from this step as it can be time consuming for large grids. Most scripts/tools now accept raw outputs
  - Hotstart: combine into a single hotstart input for restart of simulation
  - Combining ASCII outputs (max, harmonic analysis etc)
- Analysis
  - Time series
    - Extraction scripts (read_outputs9*.f90)
    - @ xyz, xyt (casts), xyzt (flow thru), or transect
    - Matlab scripts for plotting the outputs from some scripts (e.g. transect)
  - Max/min: read_output8_allnodes.f90
  - Connection to other packages (particle tracking, oil spill (GNOME))
- Visualization
  - Matlab: Vis_Matlab, for slab and transect, in animation
  - VisIT
  - Python

Wetting and drying in SCHISM

Balzano's case A for a
linear beach

Common issues in compound flood simulation

- Hydrologic flow can be very complex
- Large maximum elevations may be found near the land boundary, especially during initial ramp up or during high-flow periods
    - Pairs of source and sink in close proximity: scripts now combine these
    - Steep slopes near boundary with river inflow
    - Inverted topo near boundary
    - Poorly resolved 'dead-end'
    - Undulating channel ('water fall')
- The model is stable, but interpretation of results may be problematic
    - We typically exclude ramp-up transient responses in computing max
    - Besides more grid work in those spots, using open-boundary segments can help also (the momentum-less injection of river flow can temporarily lead to stacking-up of water locally)
    - Don't forget about the rainfall on high mountains (e.g. Delaware Bay)
    - Be careful with visualization tools

'Pairs'

'Steep slope'

NWM

'Inverted topo'

'Dead-end'

'Waterfall'
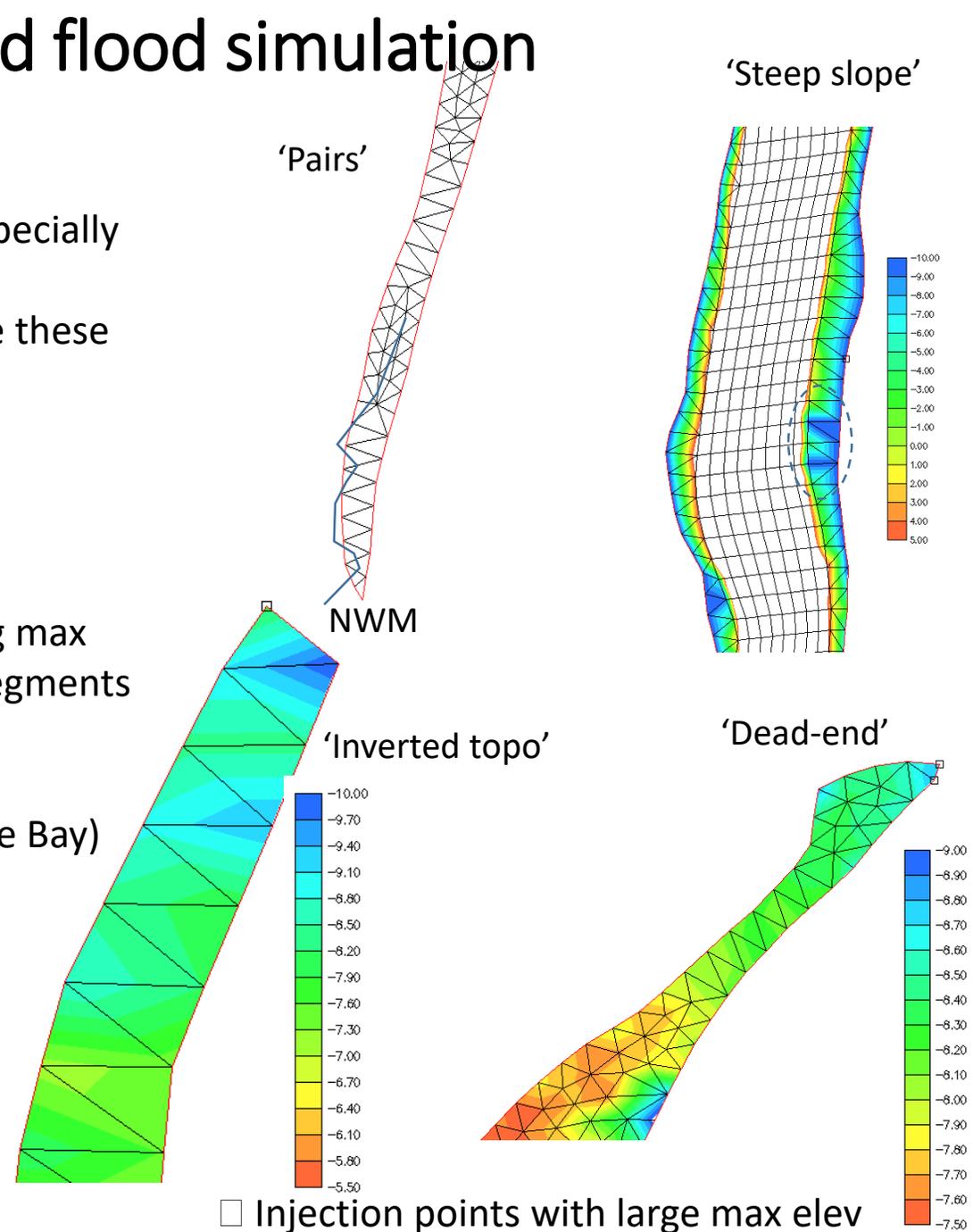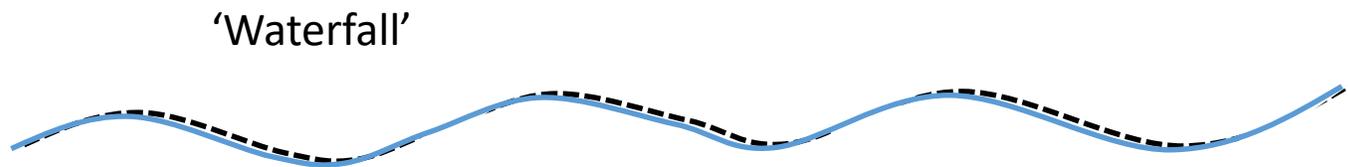
☐ Injection points with large max elev