



Visualization capability for inundation model, a NeSI consultancy

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Climate, Freshwater & Ocean Science

Inundation hazard assessment/forecasting

Flooded roads in Gisborne, New Zealand, 11 June 2018. Photo: Gisborne District Council



Inundation can occur from:

- Tsunami
- River flood
- Surface flooding (intense rain)
- Waves+Storm surge

Reliance on numerical models
(Physics based)

Inundation = Water on
normally dry land

Flood = Water level much
higher than normal



Makara Beach. credit:
ROSA WOODS/STUFF

Destroyed homes in Tacilevu village after TC Winston, Fiji, 22 February 2016. Photo: Orion Aerial Survey



Palu, Indonesia

General inundation model on GPU

One Model to simulate all inundation related hazards:

- Tsunami
- Storm surge
- River
- Rainfall
- Waves

Adaptive mesh: with Block Uniform Quadtree (in development)

Dashing: Fast on the GPU

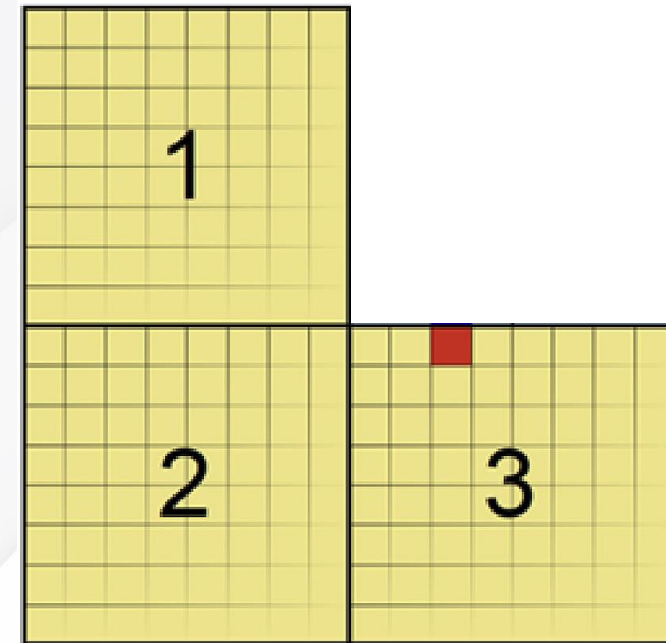
Lightweight : No frontend, frugal memory use

User friendly: easy to control, automate and force

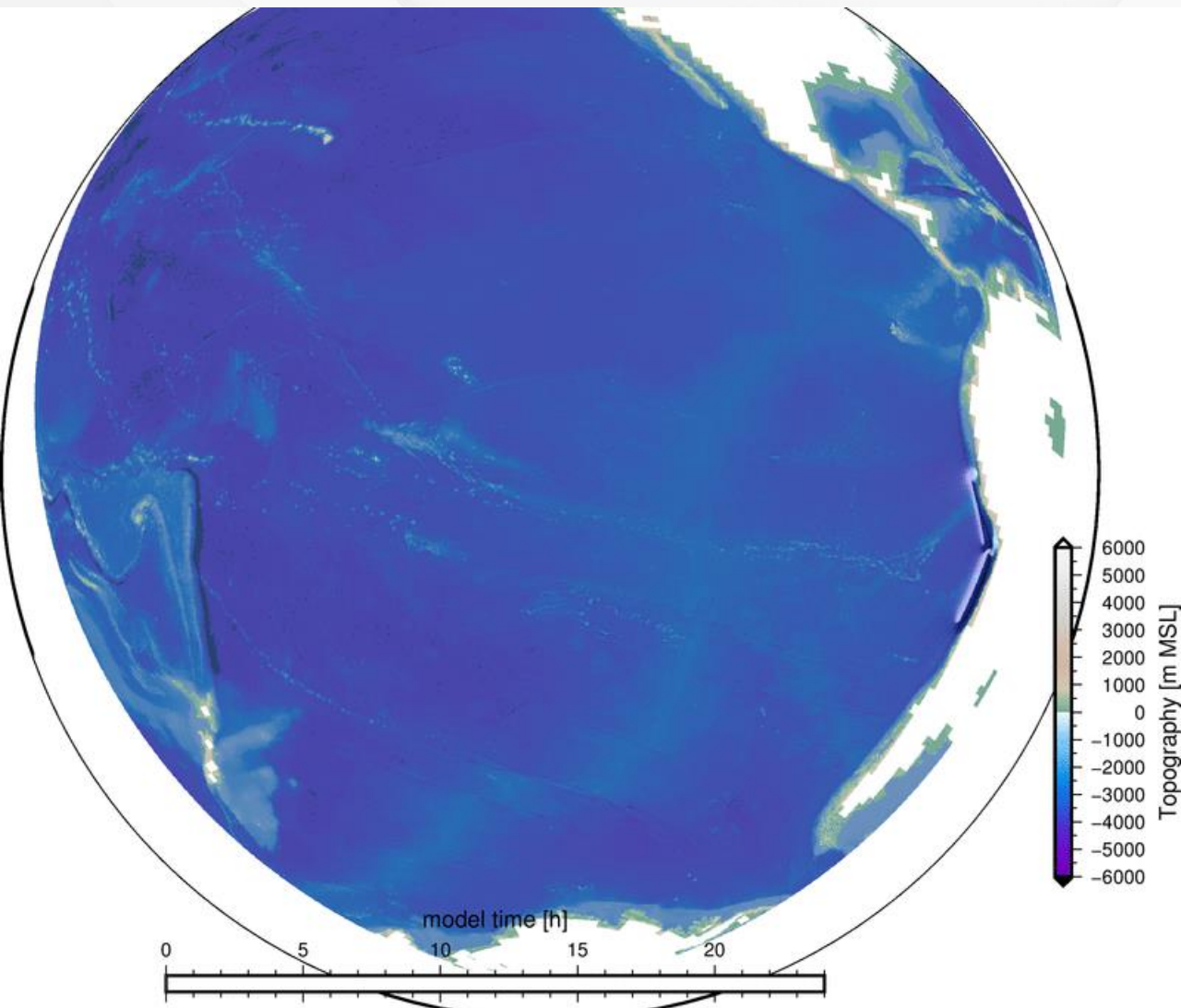
Capable: concurrent hazards (e.g. storm surge + river + rainfall)



github.com/CyprienBosserelle/BG



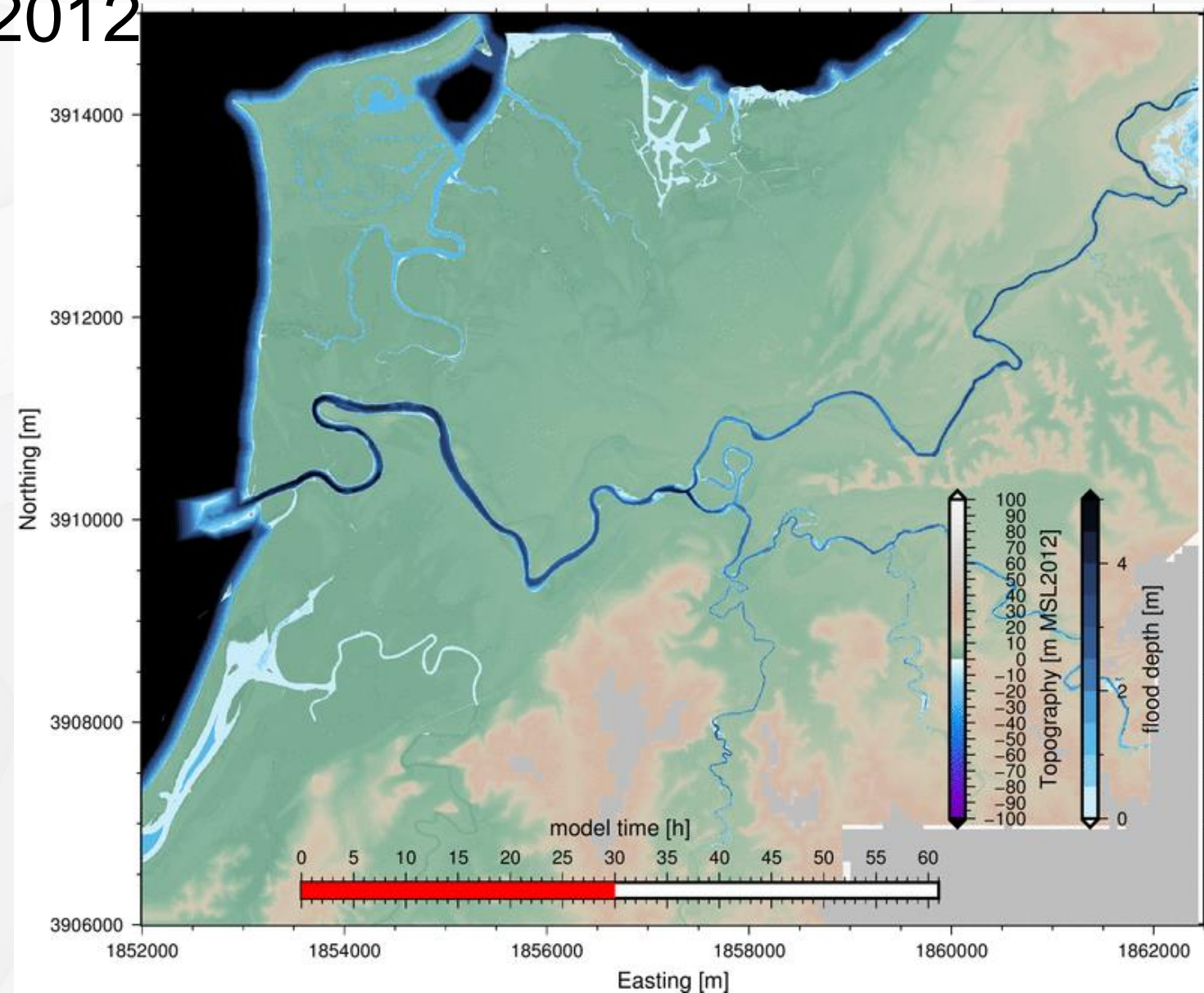
Tsunami propagation and inundation



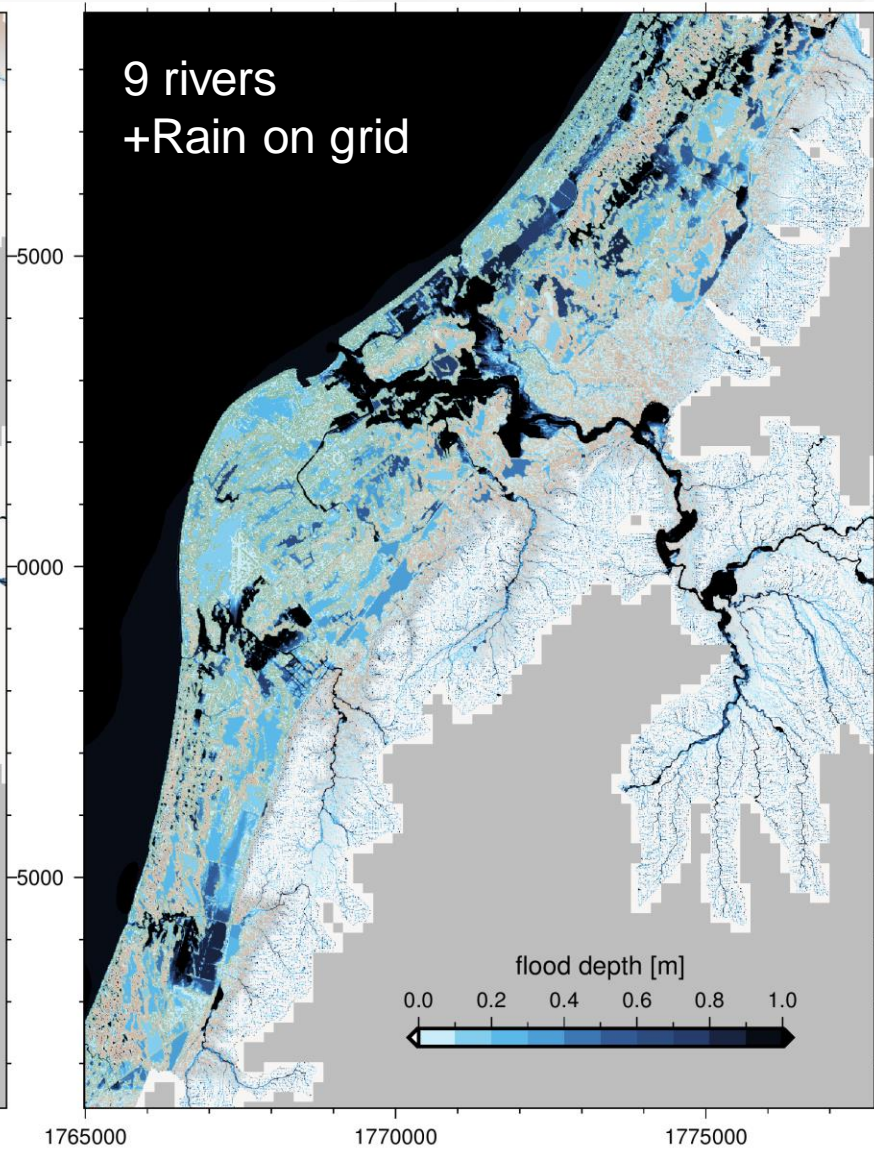
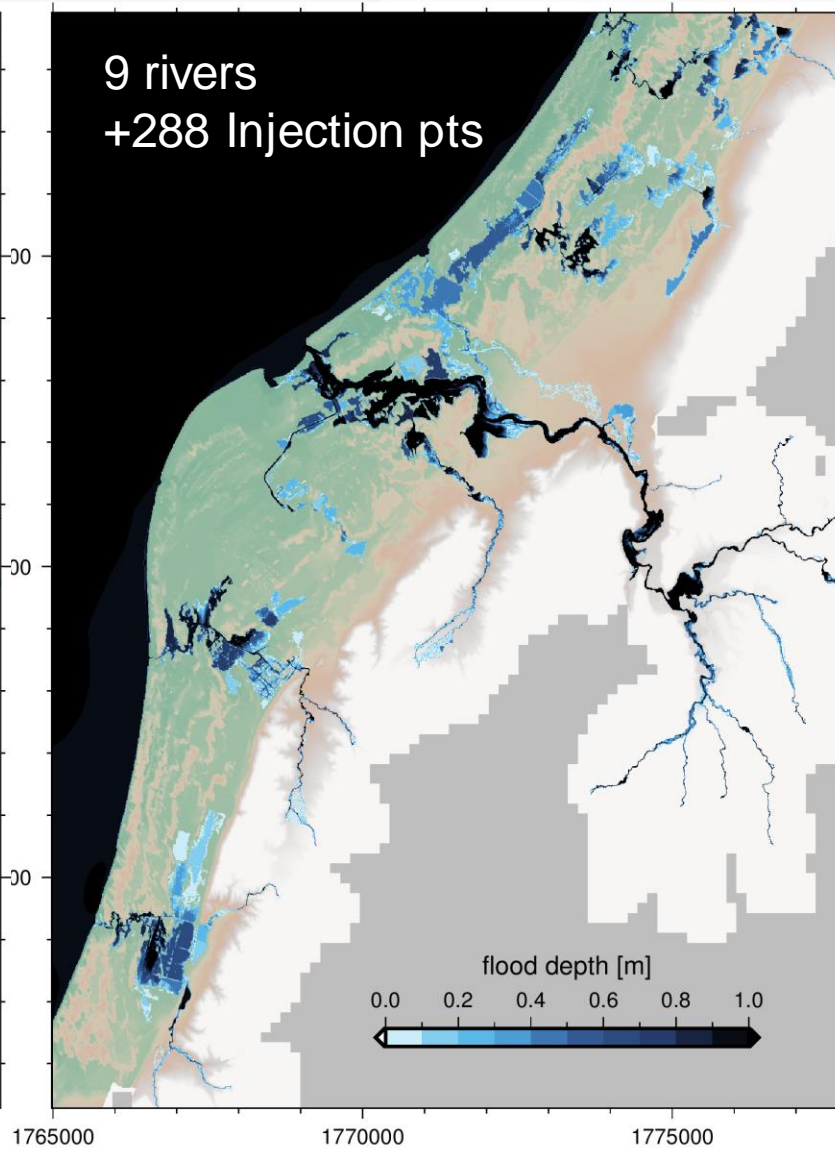
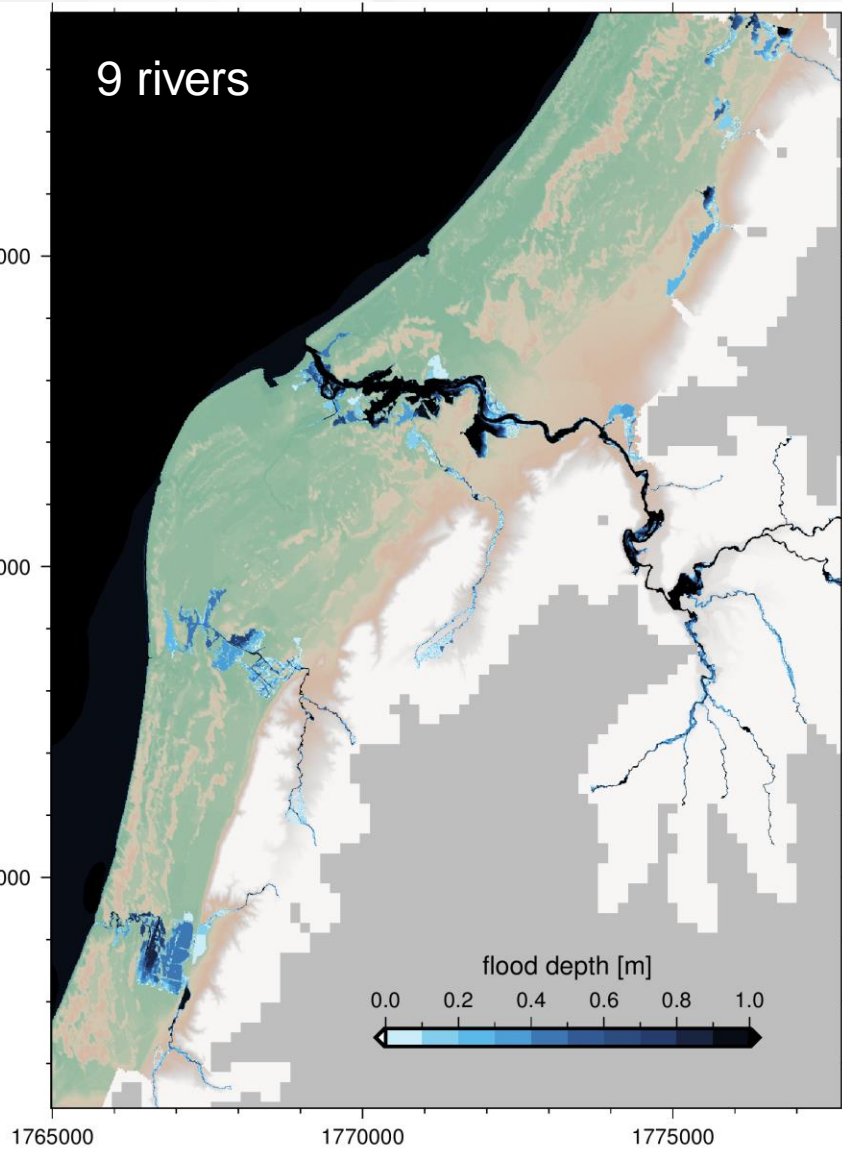
- Hypothetical scenario (1:2,500y ARI)
- ~7km res.
- Runtimes: ~15min

River inundation: Nadi 2012

- 4 rivers
- 2048x2048; 5m res.
- Runtimes: ~3hrs



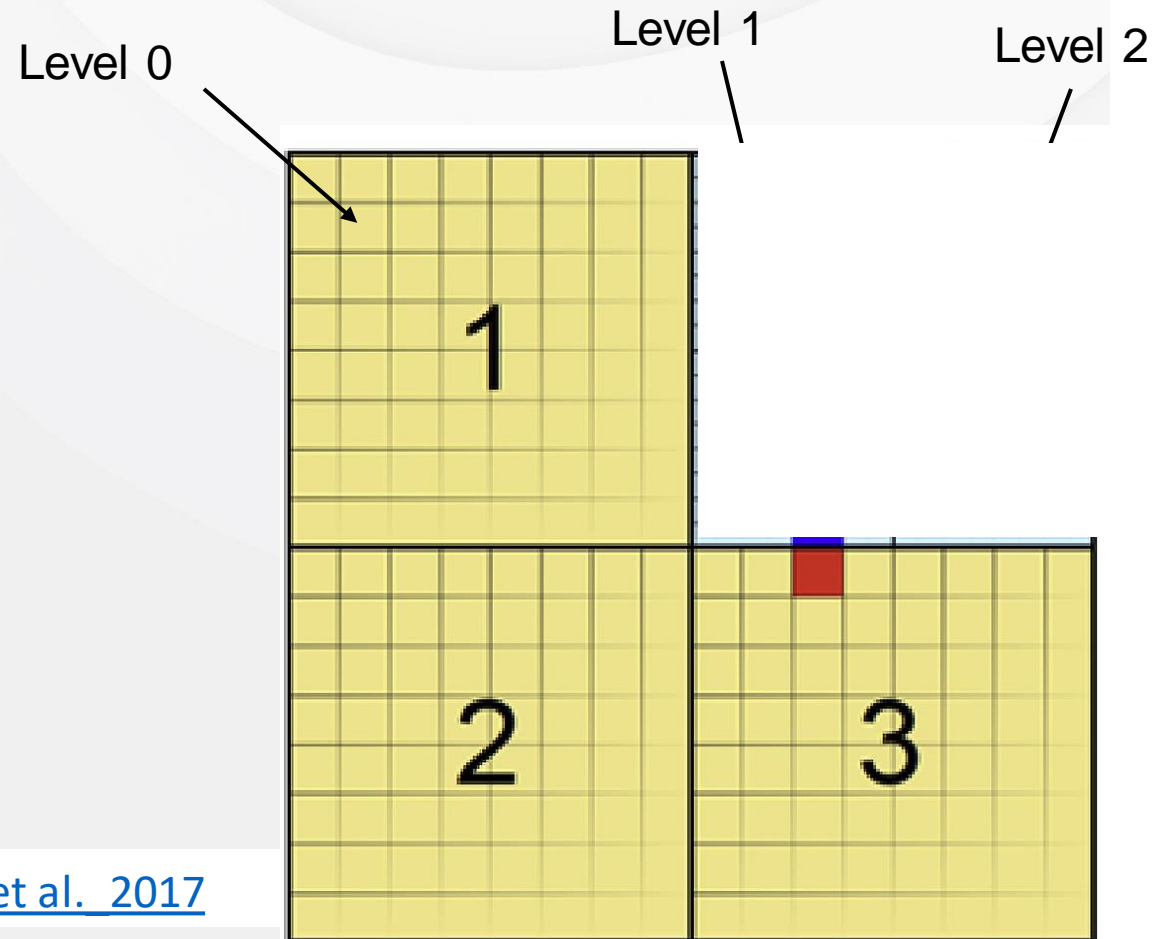
Tide+River+Rain inundation: Waikanae



Block Uniform Quadtree (BUQ)

Memory model suitable for adaptive mesh refinement (AMR) on NVIDIA GPU

Mesh geographical layout



BUQ challenges

BUQ is a non-standard mesh layout. How to best view model results

Need/Want:

- Natively supports BUQ
- Output file format with low disk space use
- Self descriptive
- Easy to view
- Easy to make great looking maps
movies

Need/Want to avoid:

- model output file needs post-processing before visualisation
- building/maintaining a model specific output file format that now one else knows how to read

NeSI to the rescue

NeSi consultancy

Accessing one or more NeSi experts to help solve my coding problems

- Free service
- Wide range of expertise
- Not for cleaning up your code

How it worked for us:

- Discuss how they could help before starting the project: Code optimisation/profiling, Visualisation...
- Help setting up the project
- Project started with minimal input from me

NeSi VTK- Catalyst visualisation consultancy

In-situ visualisation
Paraview Catalyst
Adaptor

Render an image from model parameters on disk

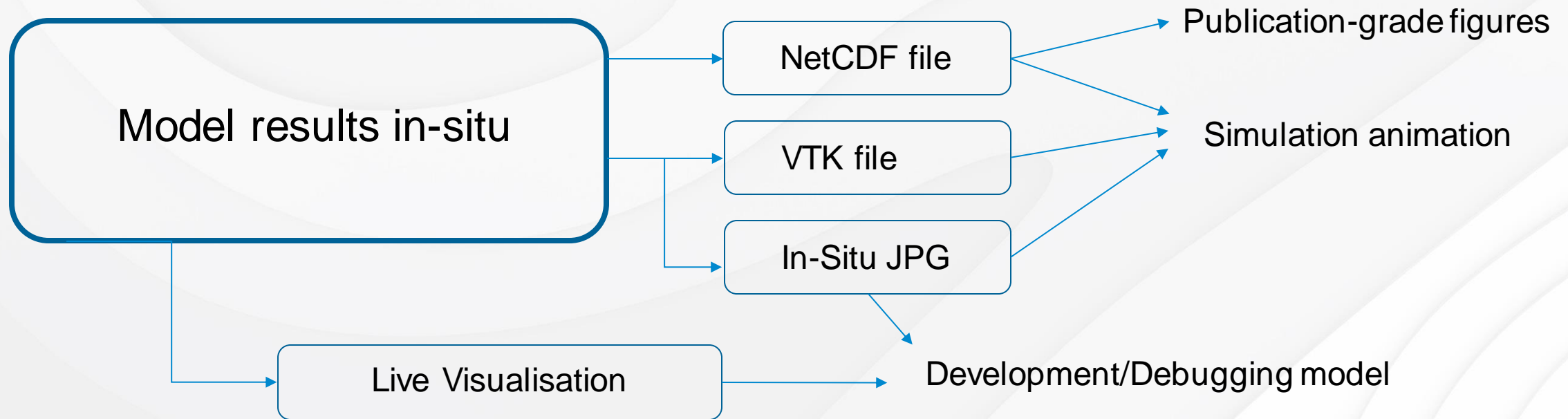
Save a VTK file to disk

Python script control

Live visualisation

Through Paraview with a Python script control

New workflow for using model output



time: 29.0



NeSI consultancy can help you

NeSI consultancy added value

- Improve my code building process (now using CMake)
- My code somehow made sense to NeSI experts

Nga mihi