Webinar: Flood Modelling Quality Control
Question Details

#	Question	Answer
1	TUFLOW looks great, does it model storm flows from steep mountain catchments well? I have found Hec-Ras limited for that.	Yes, TUFLOW has been applied to model storm flows from steep mountain for whole catchment as well. The Sub-grid-sampling(SGS) and GPU acceleration have made it possible to model the entire catchment area in a hydraulic model. Phil Ryan has covered this topic in a previous AWS webinar and there are a few good real world examples there: https://www.tuflow.com/library/webinars/#feb2021_direct_rainfall. Here is also a link to Chris's university Thesis from 2004. Section 5.3.2 benchmarks TUFLOW on slopes up to 10% https://downloads.tuflow.com/_archive/Publications/TUFLOW%20Validation%20and%20Testing,%20Huxley,%202004.pdf. It demonstrates excellent performance.
2	Can you elaborate on how to resolve issues with glass wall boundary? it is a common issues due to limited extent of topographic data.	As Chris mentioned at the start, the quality of a hydraulic model's outputs are highly dependent on the quality of input data - if there is insufficient data to represent the floodplain and a "glass wall" is intentionally retained in a model, then the results may be questionable. There may be options to use other sources of data, to at least provide a coarser representation of the area, which is likely better than ignoring it entirely. For example, SRTM (satellite) data is not as accurate as LiDAR, though is available for the entire world and would be a better solution than the glass wall model design approach in the discreate area of issue. Using it in that location will at least approximate the storage behaviour better. SRTM data can be downloaded in QGIS via the OpenTopography DEM Downloader plugin
3	Is it necessary to do hydraulic model calibration to real-time hydro-meteorological data events to ensure flood modelling quality control?	It's certainly beneficial to calibrate the model using the most recent measurement data and keep the model updated. Due to the length of the presentation, Chris is not going to cover this topic today, but you can find out more from Bill's webinar regarding the model calibration: https://www.tuflow.com/library/webinars/#maximise_accuracy We'll ask Chris to give more comment on this during the Q&A at the end of the webinar.
4	It is a common problem to rely on old discharge and water level data for calibration when you don't have data on recent flood events. Channel and floodplain topography changes in time. What is your advice to tackle situation like this?	It is important to understand limitations such as this that may affect the reliability of model results to reproduce current conditions (and communicate those limitations). Again, poor data in, means poor results out! Sensitivity testing can be important to understand the impacts of your adopted input data and parameters. If poor data is used in a model it is important to be open an transparent about it so future users of the model are made aware of the input assumptions.
5	According to your presentation TUFLOW is very nice for flood modelling, Still I have not used it, can you share the download link and installation process to this model	TUFLOW is a licenced product, however there is a demonstration version available for download: https://wiki.tuflow.com/index.php?title=New_User_Guide_Free_Demo_Version. Our free eLearning courses are also an excellent way to demo the software (https://www.tuflow.com/training/training-catalogue/#!d=e-learning). If you have any questions please email sales@tuflow.com or chris.huxley@tuflow.com
6	is there a utility to convert old model files to geopackage format?	Yes, we've included this feature in QGIS TUFLOW plugin, and have been covering this in the most recent TUFLOW trainings. There is also a short tutorial video to demonstrates how to convert an existing TUFLOW model to GPKG: https://wiki.tuflow.com/index.php?title=New_Release_Workshop_2022_-_Screen_Recordings_for_new_GIS_formats#Video_07_-_Converting_a_Model_GIS_Format_to_GPKG
7	Does Tuflow model have a module to model sediment transport and channel morphology, that combine hydrodynamics & river morphology?	Yes, there are options for this with TUFLOW. Sediment transport can be modelled as a result of the hydrodynamics without feedback, or the two can be coupled together so the topography is intermittently updated based on the estimated erosion and deposition (subsequently affecting the hydraulics). Here is the sediment transport brochure: https://www.tuflow.com/media/7192/tba17_coastal-estuarine-sediment-transport.pdf. Here is also an interesting paper of mine on the subject: https://www.tuflow.com/media/5404/2019-numerical-modelling-of-bed-sorting-and-armouring-in-meandering-channels-applications-from-the-east-fork-lewis-river-ridgefield-pits-area-usa-gao-et-al-isrs-china.pdf
8	One question about the SGS model, from TUFLOW documentation stated that SGS model was based on Smagorinsky Model from LES modelling. However, the Smagorinsky Model is the traditional way to solve turbulence closure problem by assuming isotropic turbulent length scale. In TUFLOW, SGS is just to interpolate the DEM data. I am just wondering how smagorinsky model is related to the SGS approach in TUFLOW since TUFLOW doesn't solve turbulence. Many thanks.	May I ask which documentation is that? I don't recall we have written any document relating SGS approach with Smagorinsky's turbulence model. As you've pointed out SGS is just sampling DEM at sub-cell size scale to generate volume vs elevation curve at cells and flow area vs elevation curve for faces. On the other hand, we've been advocating depth and shear velocity dependent turbulence model instead of the Smagorinsky's turbulence model for years. We found Smagorinsky's turbulence model can become sensitive to cell size, especially when the cell size is reduce to less than the depth, while the depth and shear velocity dependent turbulence model provides much better cell size convergency. This webinar should be helpful: https://www.tuflow.com/library/webinars/#sep2020_future. Here is also a paper that summarises the same findings https://www.tuflow.com/media/5023/2020-mesh-size-insensitive-turbulence-modelling-for-the-2d-shallow-water-equations-collecutt-et-al-iahr-river-flow-delft.pdf
9	Can you explain how to conduct the model in data scarce regions?	live answered during the Q&A session after the webinar

10	I hope the model is validated, but my question is how to validate in the areas which have no enough observation data?	live answered during the Q&A session after the webinar
11	What approaches can you use to identify if geometry is the cause of discrepancy between historic data and model? or when should you invest in obtaining higher resolution geometry data?	A systematic model calibration approach is useful for this purpose. Please see the following webinar: https://www.tuflow.com/library/webinars/#202104_cal. This subject is discussed at approximately the 9 minute mark.
12	What considerations should be taken into account when we change the model projection? Is only changing the layers' projection and model projection file enough?	Yes, use the GIS software to update the projection for you. Note, TUFLOW Classic and HPC only support cartesian coordinates. They do not support spherical coordinated (lat / long).
14	How do you determine the sensitivity of your model?	The modeller should determine which model parameters have the greatest uncertainty associated with them, then sensitive test by altering their value to see how the results are affected. The scale of the parameter change should be based on the expected possible range values for each parameter. This has also been answered live.
15	in the hpc.dt.csv to spot instability should keep an eye out to weird oscillation for the Nd values? Or would it just keep going down to try and become stable?	It is good practice to review Nd, Nc and Nu. If they are oscillating it may highlight a potential model health issue (typically at a 1D/2D connection or a QT, HT or HQ boundary that is not aligned perpendicular to flow). This being the case, review the dt result for the model to identify the location of the potential issue and inspect the results closely. TUFLOW will reduce the timestep to remain stable, hence it is important to review the control numbers and dt output to ensure your model design is appropriate and healthy.
	Is it capping the timestep to a max be an option?	Yes. This is a recommended option for models that start dry. The command is Timestep Maximum == <value>. It is common practice to set the value to the same value as your 2D cell size.
17	Other than using 2d_zsh, is there a better way we can model the finer elements in a 2-metre cell size (e.g. how to model a 0.8m wide spoon drain) to have a better representation of the surface?	There are options: 1) You could use Sub-Grid Sampling to account for the topography variation. 2) Model the spoon drain at a finer resolution 2D cell size (using quadtree). 3) Model the spoon drain geometry in 1D. To do this, deactivate the 2m cells where spoon drain is locationed. Connect the 1d_nwk spoon drain objects to the 2D using 2d_bc CN points (snapped to the 1d_nwk nodes/channel ends) and a single 2d_bc_HX line (not two, like a traditional open channel 1D/2D nesting)
19	will there be another 2022 release training in Brisbane?	If there is sufficient demand we will aim to run another workshop sometime next year
21	just to confirm, did you say earlier that 2d_zsh (breaklines) will properly reflect your elevations on those areas regardless of the model cell size?	It is a far more reliable approach to defining the crest elevation of raised hydraulic controls (embankments, levee, roads, railway lines etc.) than relying on cell sampling of the DEM. TUFLOW will translate the crest values to the cell faces where the passing of water between cells is calculated. After adding 2d_zsh inputs, complete result convergence testing to identify the largest suitable cell size to achieve a reliable reproduceable answer (see: https://www.tuflow.com/library/webinars/#nov2020_2d_cell_size)
22	Do the breaklines (thick line vs thin line) impact how TUFLOW use the elevation values?	Yes, these options apply the topography updates slightly differently. The thin option transfers the breakline elevation to the cell face only (impacting water flows from one cell to it's neighbour). The thick option updates the cell face and also cell centre. Updating the cell centre alters the cell storage in addition to the behaviour exhibited by the thin option. This eLearning module explains the difference in detail: https://www.tuflow.com/training/training-catalogue/tt103e-2d-topographic-layering-and-modification-options-elearning/
23	Is DEM_Z check represents all the finalized elevations , or we have to consider that with Zshp?	Both files will show the finalized elevation. _zsh_zpt check file picks up the location modified by the Z shape layer only, while DEM_Z shows the final elevation in the entire model. If you're using SGS method C, you can also get a high-resolution DEM_Z_HR check file.
24	So far TUFLOW only simulates, assuming fixed river bed level (which is not real case scenario), the model does not take into account the sedimentation and scour process, occurring in the waterways during large flood events. Is any development in TUFLOW model to take into account this process?	Dynamic coupling of hydrodynamics and erosion and deposition changes in topography is available in TUFLOW FV. Here is the sediment transport brochure: https://www.tuflow.com/media/7192/tba17_coastal-estuarine-sediment-transport.pdf. Here is also an interesting paper of mine on the subject: https://www.tuflow.com/media/5404/2019-numerical-modelling-of-bed-sorting-and-armouring-in-meandering-channels-applications-from-the-east-fork-lewis-river-ridgefield-pits-area-usa-gao-et-al-isrs-china.pdf
25	Hi All. I joined late today so apologies if this has been covered. Is there a plan to output the SGS points as a check file (as 2d points with z elevations) and/or a higher resolution _Z_check file? I'm constantly being asked whether this is possible :-)	The 2022 release includes a high resolution DEM check file in a raster format. If you attend the 2022 release training events currently being run in the Australian capital cities you will learn about this feature. Here is the registration link: https://www.tuflow.com/training/training-catalogue/tt158-tuflow-2022-release-workshop-australia/