

## Q&A Making Waves: Wave modelling with SWAN

Question	Answer(s)
1 Is the multi directions of waves can be modelled? or it is only one direction.	Yes multi-direction waves can be modelled. If you are interested in wave diffraction and refraction from structures/headlands you can use a phase-resolving wave model (we will go over this in a bit). If you want to put in multi-direction waves in a model boundary you can do that by inputting the waves as a spectrum.
2 fetch is calculated on water body? not from up of hilly land area.	Fetch is calculated only over the water body
3 Will you share the presentation slides after this meeting?	Yes we will share a PDF of the presentation at the webinar on our website. Thanks!
4 Is there a minimum fetch usually required to generate swell waves?	Not exactly, this is because wave period is a function of both fetch and velocity.
5 Celerity is wave velocity, just forgot and trying to recall.. please correct me if I am wrong..	yes it's the speed of a single wave
6 How to estimate wind duration in the wave nomograph to calculate wave height? We can calculate wind speed and fetch length?	Wind duration you specify, it will depend on what waves you want to estimate - i.e. if you want to know what the approximate wave height generated by an average winter storm, then you would use observed wind data to estimate the average storm wind and use that as input. You could then look at the standard wind direction during a storm and then calculate fetch in that direction.
7 Why does a consistent wind produce periodic waves - there is a particular frequency for waves produced from wind blowing for periods of time and over a long fetch which has a seemingly random pattern to its gusts?	When wind blows over the water surface, it imparts momentum to the water molecules near the surface through friction. This momentum creates ripples which are initially small and irregular, as the wind blows over the water surface, it continues to transfer energy leading to growth of the ripples into larger waves. Waves of different wavelengths and periods travel at different speeds due to dispersion. Longer fetch lengths allow for more time for waves to organise into groups. There isn't a single specific frequency as it depends on various factors, including wind speed, duration, and fetch length.
8 Can SWAN be used to model waves at a rivermouth to understand the possibility of inland flooding?	live answered
9 How can we differentiate between swell and infragravity wave?	We base it on wave period. Infragravity waves are typically considered to have a wave period greater than ~25 seconds
11 Can we see waves overtopping on a structure and propagate over the land?	Not in the SWAN model. We would use the SWAN model outputs and add them into an overtopping model (e.g. EurOtop).
12 And the velocity is driven by the wind speed primarily?	Correct!
13 can this be applied to very shallow lakes? e.g. waves in a shallow pond that is say a 2 x 2 km lake with 1:200 slopes from the edge.	Yes, I think this would be the perfect case for a SWAN model.
	SWAN uses an approximation for wave breaking, so for a shallow lake, it's more efficient to use an empirical fetch calculation for shallow lakes and reservoirs.
	empirical methods generally assume a constant depth though right? Whereas on a tailings dam you'll have a gentle beach slope that will then hit a steep embankment. At the embankment, water depth could be very shallow, but 100 m away it could be a meter deep.
14 Is it okay to use SWAN output as boundary conditions for XBeach?	Yes, we do this all the time. You can extract the SWAN results at the XBeach model boundary and use that as input.
15 Can we use this model on large rivers during flooding?	live answered
16 Is the main waves are due to wind, what setting should we change in the model?	It depends on how big your model is. If over the entire fetch length then you can just force the model with wind only. If less than that, you'll want to input both wind and waves. In terms of settings you'll want to test the windgrowth function - e.g. GEN3 KOM. Typically for mixed sea-swell conditions the WESTH formulation performs better, while for closed waterbodies, KOMEN performs better. Ideally when you are calibrating your model you test all formulations and pick the one with the lowest error statistics.
17 If we are just modelling impacts of Astronomical tides and we have tidal gauge data for only one or two tidal gauges, can we use SWAN model as an input file for Coastal hydrodynamic modelling in TUFLOW?	If the tide gauges are near enough we would use those as inputs. Otherwise we'd recommend using a hydrodynamic model, i.e. Delft3D-FLOW, which accounts for current
18 Is there any possibility of offering the course online? I am interested in attending. I am doing coastal erosion research in Fiji using hydrodynamic modelling and shoreline analysis.	All our training is live and ONLINE. If you can't attend live due to timezone difficulties the recordings are uploaded to the learning platform and you can catch up via the recordings.
19 Thank you Daniel for your presentation. However, I have one question- how much the bathymetry is responsible to impact Waves?	live answered

20	How resolved is the mesh in SWAN usually? (in terms of surface area maybe)	Typically about 30 m nearshore increasing by a factor $\sim 1.15$ as you go offshore. It really depends on the complexity of the region and where you want to extract your results from. If you're into coding, look up OceanMesh (python) and OceanMesh2D (matlab), these are great repositories to quickly create flexible meshes.
21	what was the name of the software to preview SWAN results?	Blue Kenue
22	I am from India, currently studying in Taiwan & working on seafloor mapping. And my another question is how much we can rely on satellite bathymetry compared to MBES, LiDAR?	It's a great source when you have limited nearshore bathymetric survey data available, obviously if you have green LiDAR or multibeam bathy then that is better. SDB can generally give you depth of up to 20 m with a horizontal resolution of 10m. For wave modelling it is good enough.
23	How impactful and why do offshore winds effect the shape and wave types as they break close to shore?	Offshore winds, so winds that blow from the land to the sea, blow against wave faces. These can have several effects, firstly they can delay breaking because the wind blowing against the wave face provides some resistance, slowing down the forward motion of the top of the wave. They also tend to flatten the wave faces.
24	Where can find our main file of Bathymetry of our model?	It depends where in the world you are modelling, often each country will have resources available, otherwise you can use sources such as GEBCO
25	You mentioned the availability of nearshore bathymetry from satellite? Where is that available please?	There are 2 options, you have providers such a EOMAP where you can purchase the post-processed SDB, otherwise you can do it yourself by downloading Sentinel-2 imagery - there are several codes on GitHub that can help you get started (don't forget to appropriately reference them).
26	Is near shore bathymetry data usually taken from DEM resouces?	Ideally bathymetric survey data is used, i.e. multibeam, green LiDAR. Where that is not available or covering the extent of the model you can suppliment with SDB.
27	Thanks for the nice presentation!	