Practical Approaches for Probabilistic Tsunami Hazard and Risk Assessment

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Background

Large-scale probabilistic tsunami hazard and risk assessment (Fig1.) require many numerically-intensive simulations of the seismically induced tsunami events, involving tsunami phases of **(A)Generation, (B)Propagation and (C)Inundation** on the coast which are not always feasible unless large computational resources like HPCs are at ones disposable.

The advancements in computational and numerical methods like parallel processing, GPUs, unstructured meshes and nesting techniques etc. help to undertake a regional PTHA on large portions of the coast involving multiple sources zones, but we still need concepts and algorithms for reducing the number of events simulated, or rapidly approximating the simulations results.

Handling the Challenge of Scales

This computational challenge of scales (highlighted in Fig.1 of hazard module as red) is not foreign and previous works have handled them in different ways, mainly: **(1) Reducing the number of scenarios modelled for inundation (2) Using approximation methods(amplification factors) (3) Surrogate modelling(emulators)** but are limited to application in localized studies or forecasting.

This PhD work proposes to revisit such methods and explore a data driven approach for the event based risk modelling, with a focus on understanding the impact of using them on the probabilistic estimates of tsunami hazard/risk and further to evaluate their performance in comparison with the traditional approaches for a test region.

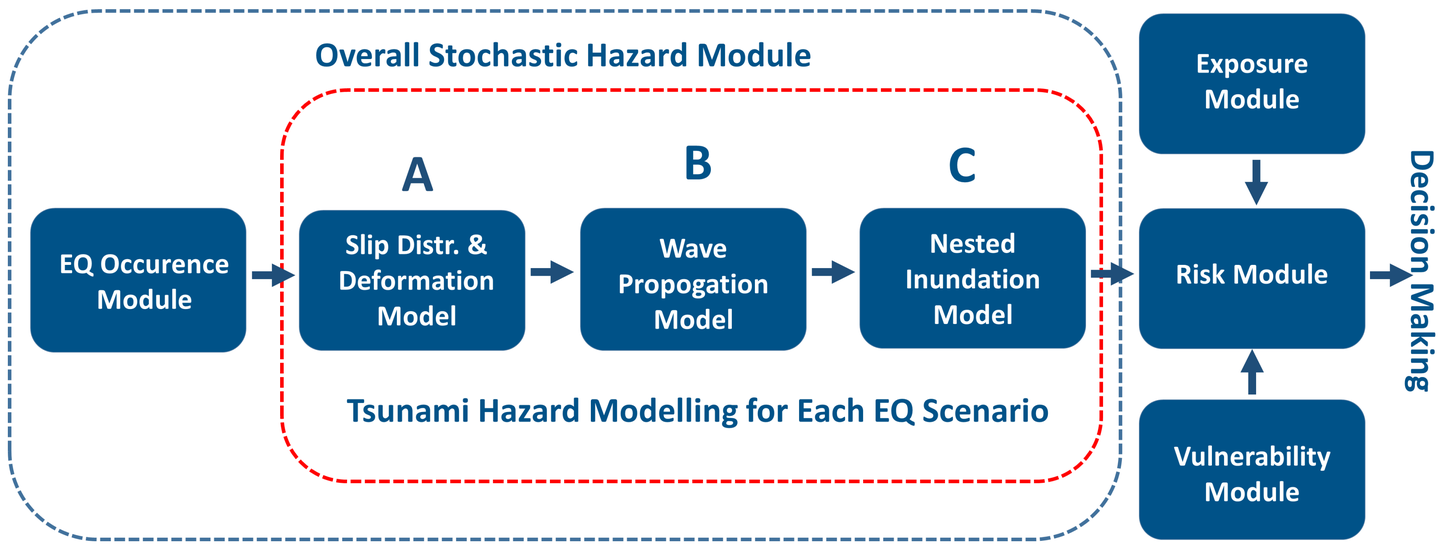

Figure 1. *Workflow of probabilistic tsunami risk assessment(EQ sources)*

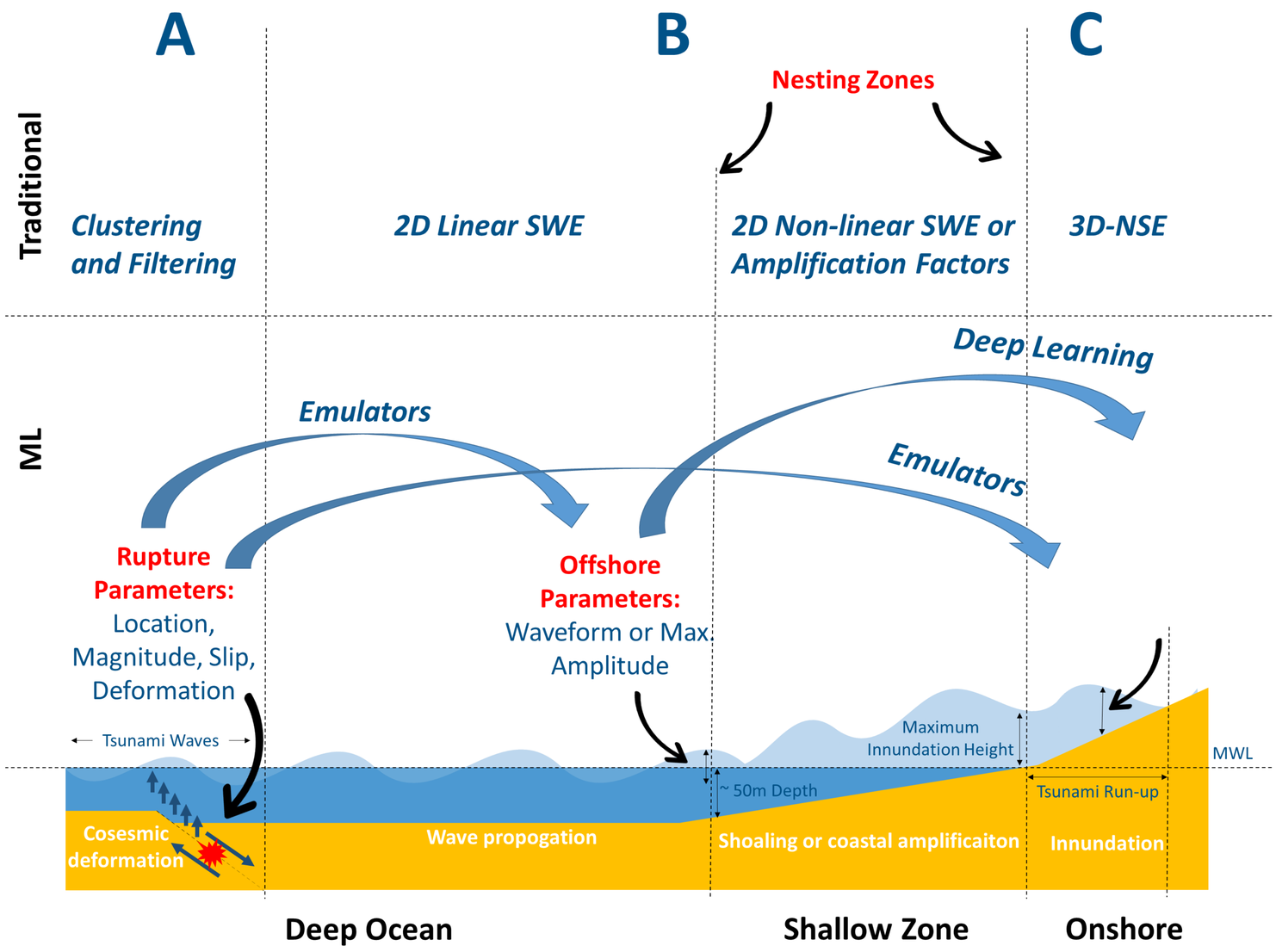

Figure 2. *Representation of tsunami from off-to-on-shore and methods*

Possible Solution? Join my presentation EGU22-5642 to learn more

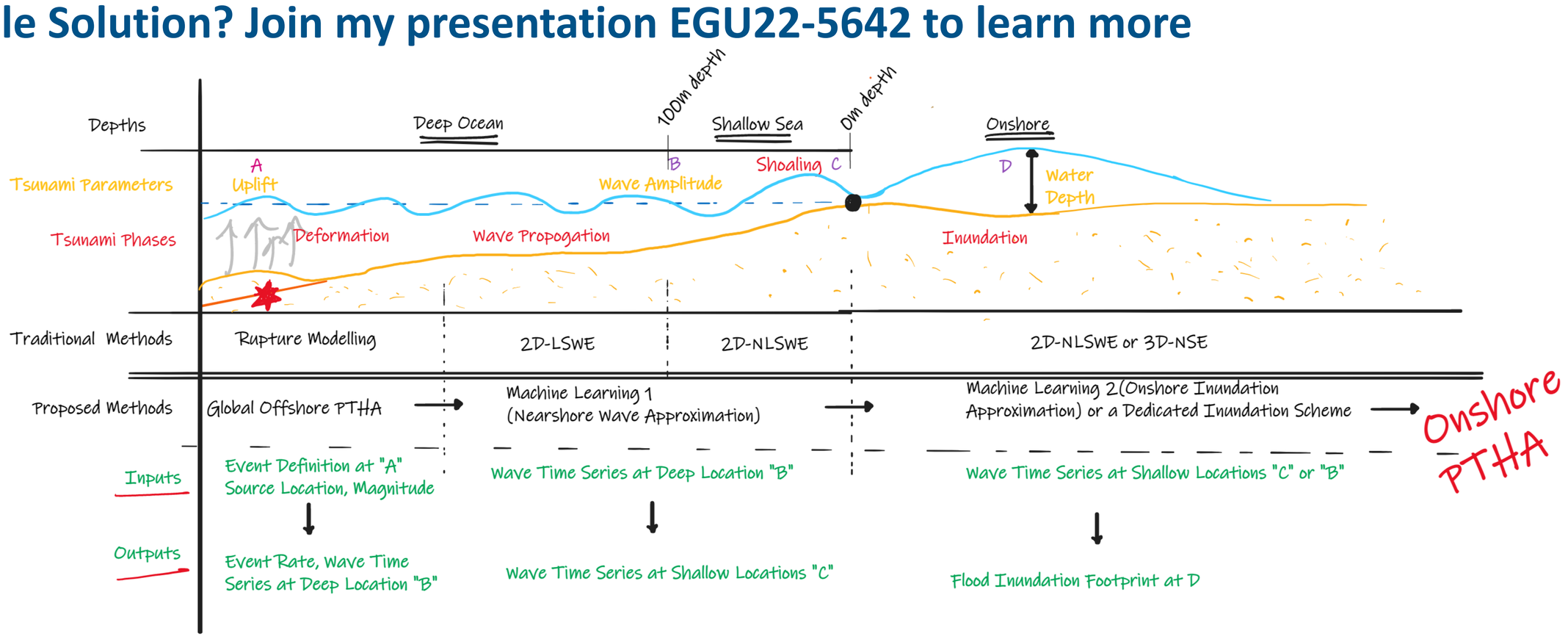

Figure 3. *An overview of methods used in PTHA and a proposed alternative*