How we do it: ASCETE reference model

The tools we use: the ASCETE framework

What we do: the ASCETE workflow

Fully staggered Eulerian, conservative finite difference scheme to

Velocity, temperature, composition, and visco-elasto-plastic rheology
term subduction model as initial conditions for the dynamic earthquake model.

conditions for a megathrust earthquake by using information for 1 slip event in the long

SEISMIC CYCLING TO EARTHQUAKE:

MODEL

SEISMO-THERMO-MECHANICAL


full integration of subduction and earthquakes in a scheme to
couple subduction evolution of compositions of fluids, microwaves, energy,
temperature, topography, and intrusion of fluids chemical evolution
in space and time

and temporal scales.

study subduction zone
tsunami generation to

We present methods to

long term

subduction, rupture of a

link together long term

study subduction zone

tsunami generation to

simple test cases

SIMPLIFIED EARTHQUAKE RUPTURE SCENARIOS:
The earthquake models incorporate a planar fault, extending from the

seafloor to 35 km depth, dipping 16 degrees, and surrounded by a

homogeneous crust. The Model A earthquake has no slip to the trench; the Model B scenario has slip to the trench.

COUPLED TSUNAMI RESULTS:
The time-dependent vertical displacements from Models A and B are used as tsunami sources. The tsunami model domain is as for

the ASCETE reference model, except that the beach toe is located at x = 240 km. The cross-sections in the snapshots of

wave heights shown to the far right are along y = 0, as shown for

the ASCETE reference model (below, left).

COUPLED MODELS SUCH AS THESE ARE USEFUL FOR:

Isolating the influence of a single earthquake characteristic on
tsunami behavior.

- We demonstrate this by comparing results for the 2 earthquake scenarios: one

with and one without slip reaching the seafloor.

- Isolating the effect of a model choice on modeled tsunami behavior.

- We do not aim to answer these geophysics questions, but present them

as examples of the utility of coupled, physics-based models.

When are dynamic displacements required to make a relevant tsunami model?

➢ When point of interest is earlier in wave travel-time?

➢ How does slip to the trench influence the tsunami?

➢ Higher wave at coast?

➢ Longer coastal inundation? In both time & space?

➢ Slower earthquakes? (Model A tsunami vs. reference model tsunami)

➢ Isolating the influence of one slip scenario?

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