# 2D Numerical Simulation of Intraoceanic Subduction during Upper Jurasic Closure of Vardar Tethys

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**Geological problem**:

We adress the problem of closure of Vardar branch of the Tethys Ocean. This is generally thought to happen during the Upper Jurassic period. Ophiolites are found on the western plate and are thought to be remnants of the ocean closed during Upper Jurassic time (Vardar Tethys). The ophiolite-like igneous rocks are found on the eastern plate and constitute the so called Sava-Vardar Zone. We use numerical modelling approach using thermomechanical code I2VIS (Gerya, Yuen 2003) to simulate an intraoceanic subduction which transitions into collision process.
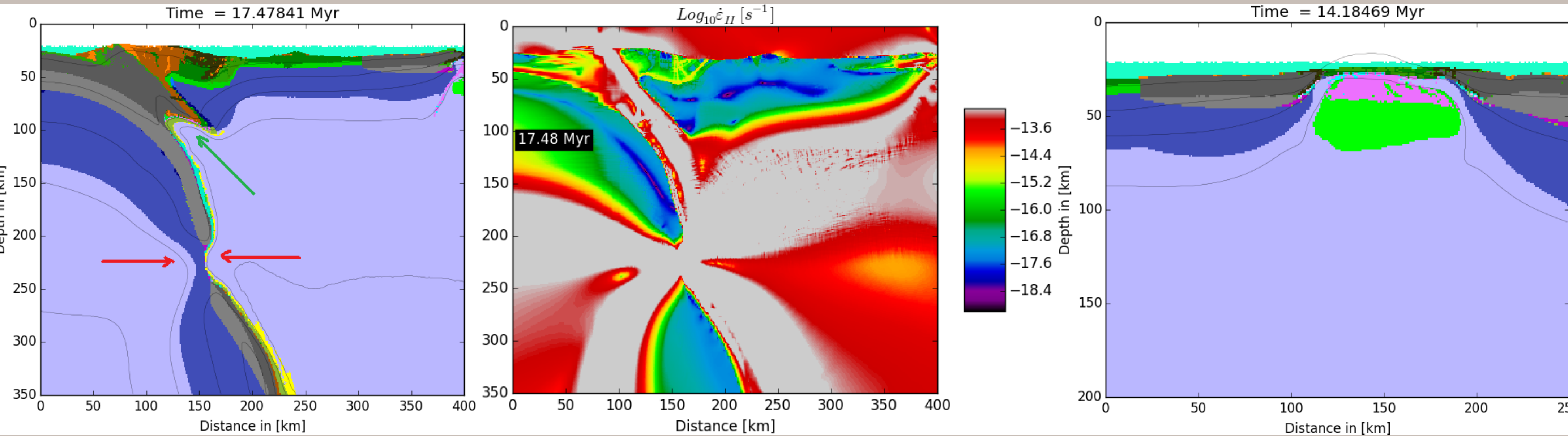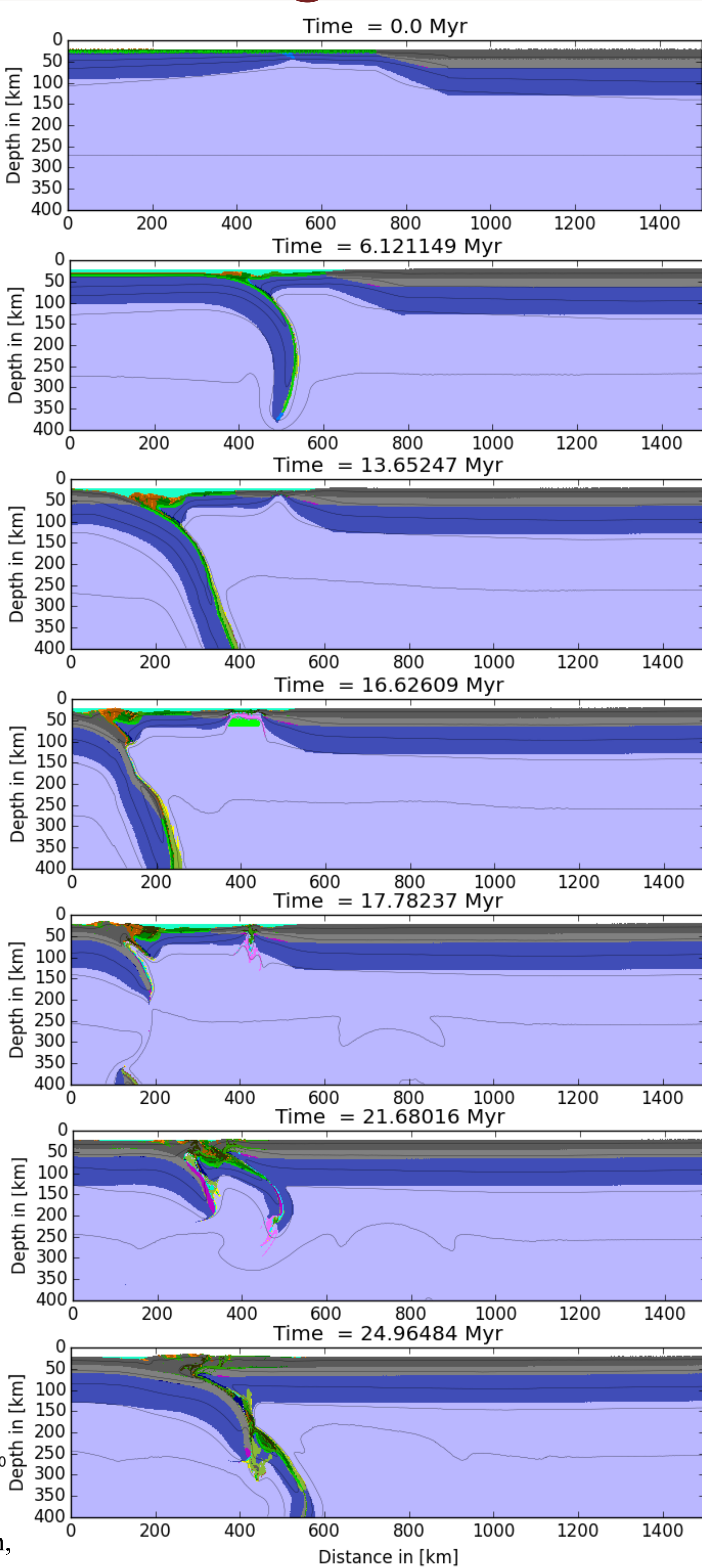
**Boundary and initial conditions**:

Velocity condition is free-slip on the left, right and top boundaries, and permeable at the bottom boundary. Temperature: constant at the top and bottom boundaries. Inital convergence assigned to the continents (4cm/y eastward and 2cm/y westward) and sustained throughout the simulation; Adiabatic temperature gradient of 0.5 K/km is assigned to the mantle, ~12K/km gradient within continents, 1617K at the lithosphere/asthenosphere boundary, temperature within the oceanic plates calculated based on the age, which increases with the distance from the ridge. Simulation is calculated on a 1390x351 grid of spatially variable resolution.

**Preliminary results**:

Tethys ocean is closed during the Upper Jurassic period (around 20 - 22 Myr from the start of the simulation)
We produce a transient (~4 My lifespan) spreading center near the Euroasian margin. New oceanic crust, later partially emplaced onto Euroasia could be interpreted as ophiolite like rocks. Closure of the center is contemporaneous with the arrival of the trench to the margin of the western continent and the consumation of the western ocean slab. Slab detachment phenomenon occurs at around 18My. The remnant ocean slab (eastern) and the near margin portion of the continent subducts under Euroasia along the old spreading center which serves as an interface. Later stages of the simulation show the detachment of remnant ocean slab, hydration of mantle under the wastern continent and continental colission process (deformation of upper crust, delamination)

**Future modelling:**

Presented simulation is being used as a reference model. We are working on adressing other parameters such as changing porous fluid contents, amount of sedimentation, different rates of convergence (+ time-dependent convergence rate).