NARG Steering meeting
Delft | Sept. 2019

TUDelft

Early Jurassic and Early Cretaceous source-to-sink systems in central Morocco approached with pyBADLANDS

Rémi Charton | Giovanni Bertotti
Jonathan Redfern

// Objectives

1) Sedimentary entry points & budgets
2) First-order paleo-altimetry & stratigraphy
?) Exhumation triggering mechanism(s)

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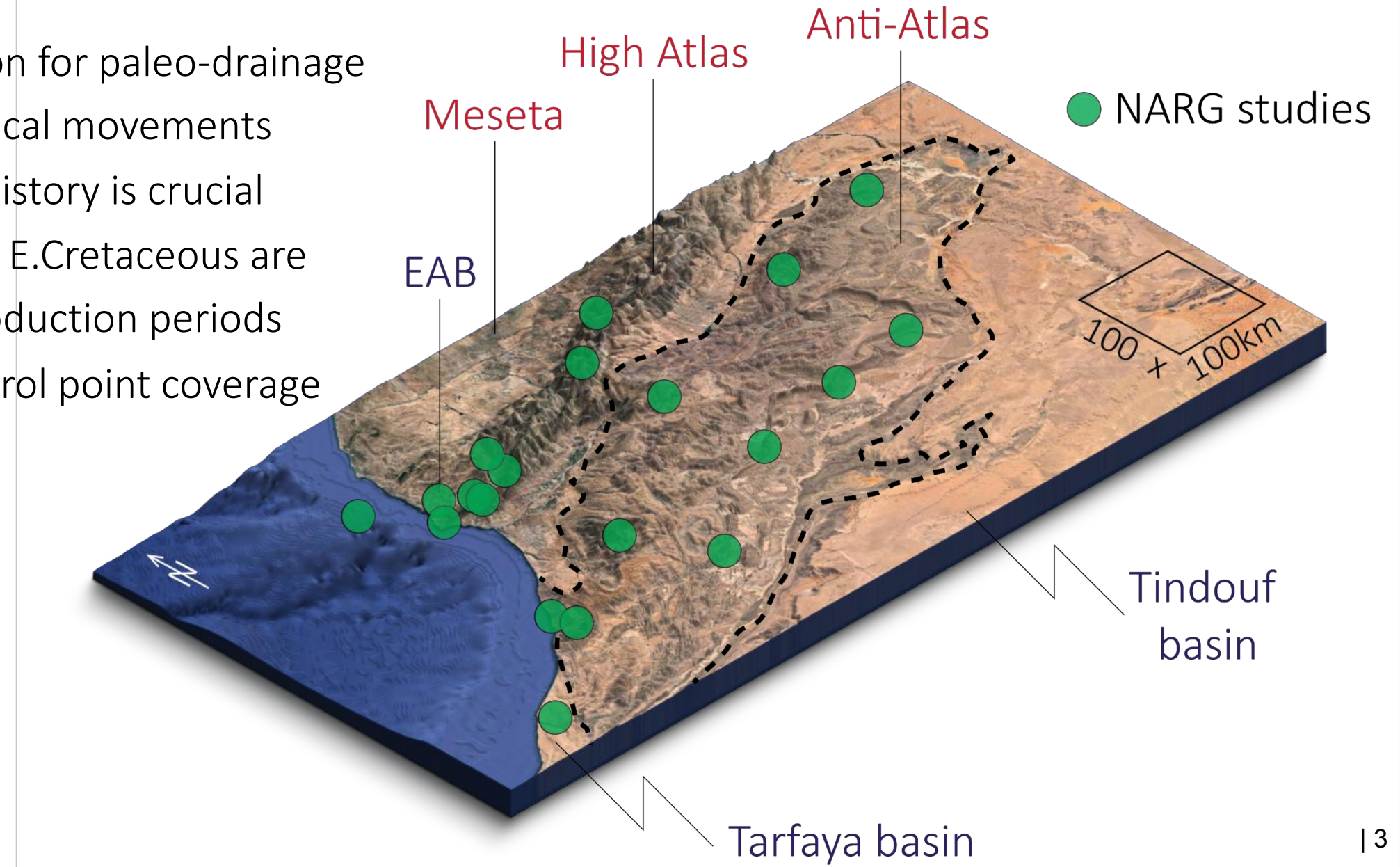
1 ••• | Why there and then?

- Critical location for paleo-drainage
- Km-scale vertical movements
- Accurate t-T history is crucial
- E.Jurassic and E.Cretaceous are high sediment production periods
- Excellent control point coverage

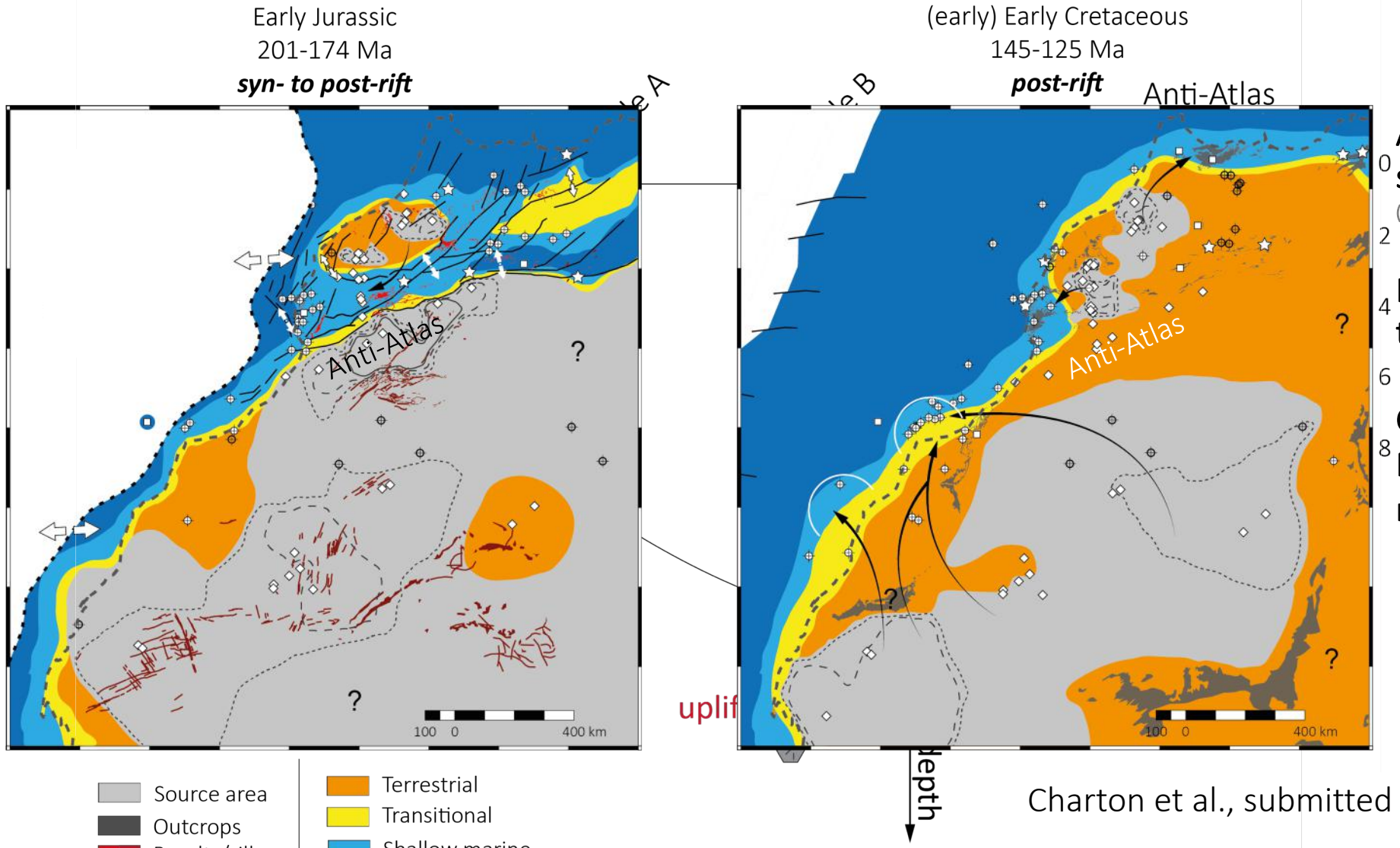


1 ••• | Steering the model: exhumation data

Anti-Atlas exhuming
(e.g. Gouiza et al., 2017)

Resulting topography?

Sourcing surrounding basins?



Anti-Atlas subsiding
(e.g. Gouiza et al., 2017)

Initial topography?

Covered with Meseta/Reguibat material?

Charton et al., submitted

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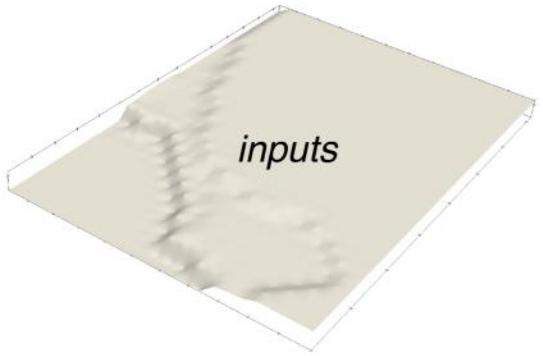
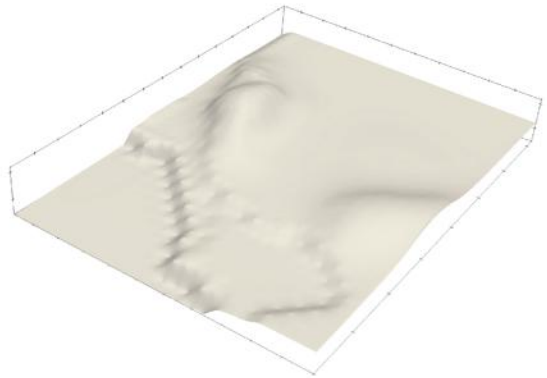
t0 ➔ t1

initial topography
ts0

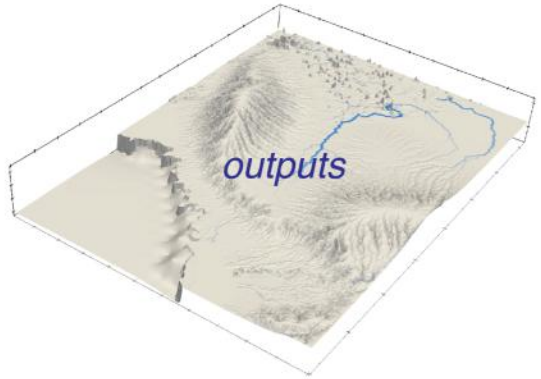


temporary topography
ts0.1



= ini. topo. + ***input uplift t1***

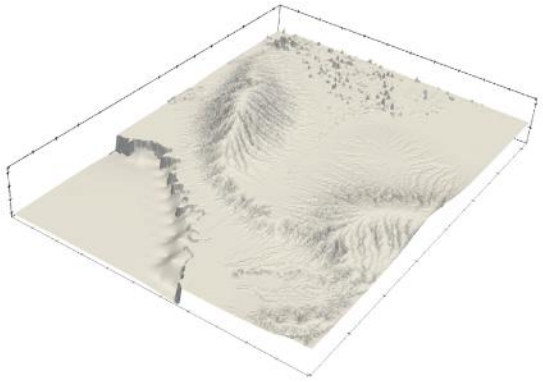
final topography
ts1



= temporary topo. -
erosion + deposition

t1 ➔ t2

temporary topography
ts1.1



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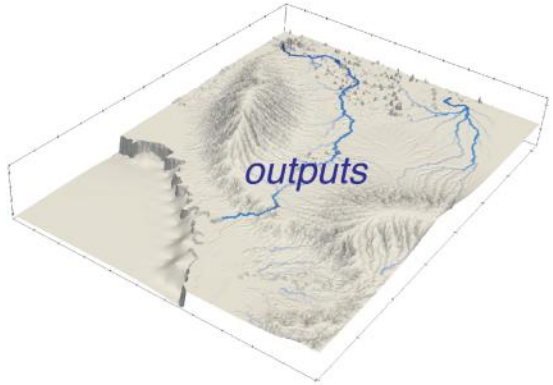
final topography
ts2



= temporary topo. -
erosion + deposition

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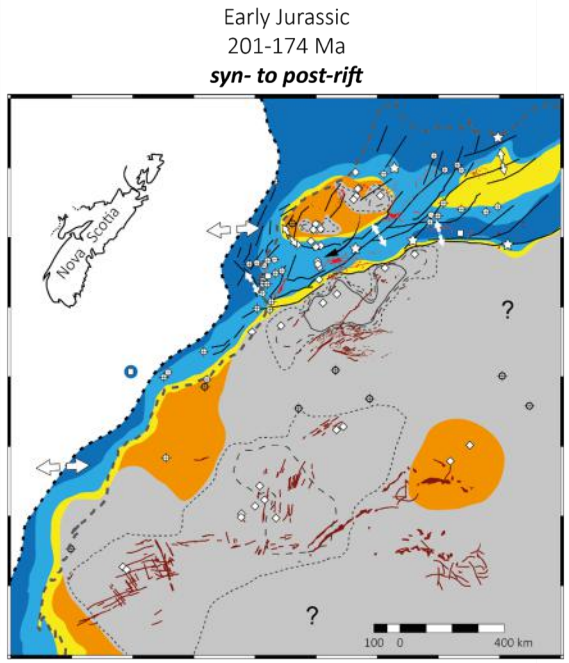
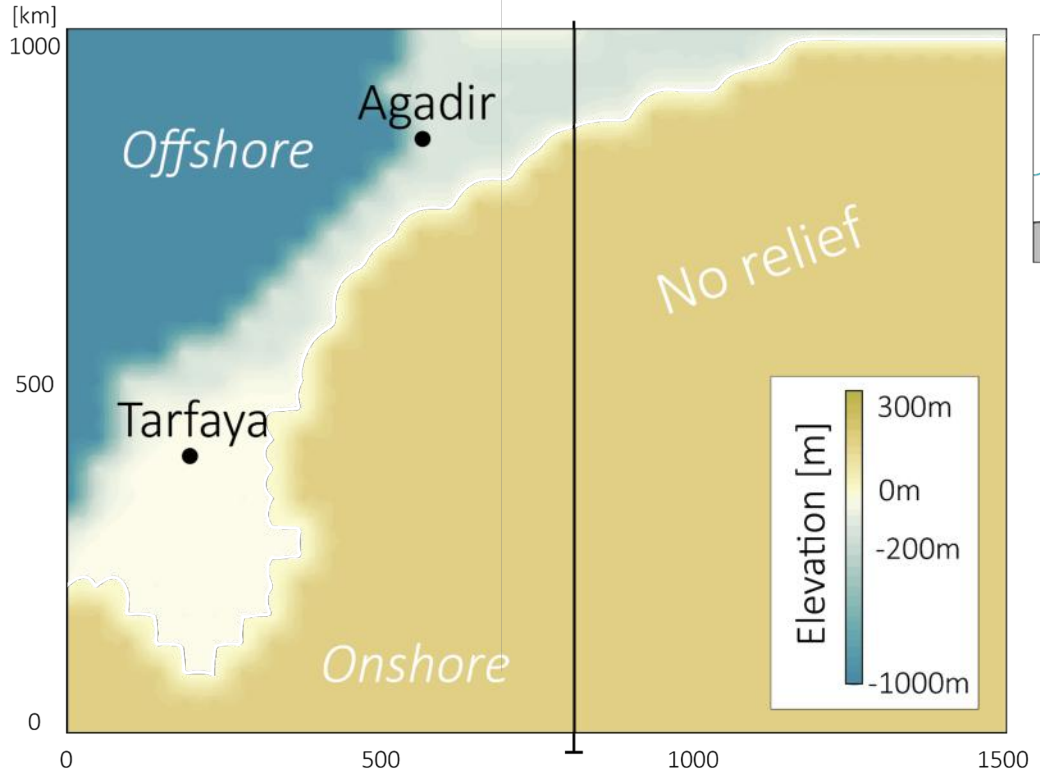
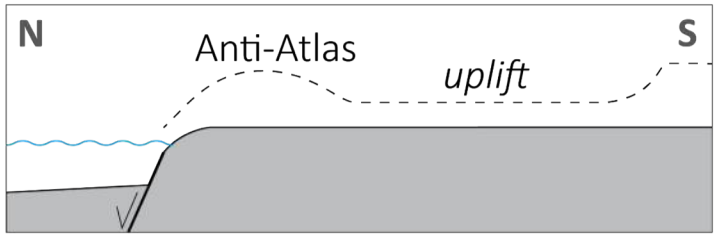
2 | Early Jurassic (eJ): Setup design







↑ *Simplified tectonic scenario*
← *Initial topography map*
↓ *Other inputs*

Grid	Model	Boundary	Run time
5x5km	1000x1500km	Flat	201-174Ma

Sea level	Rain	Flexure	Waves
literature	literature	On	Off

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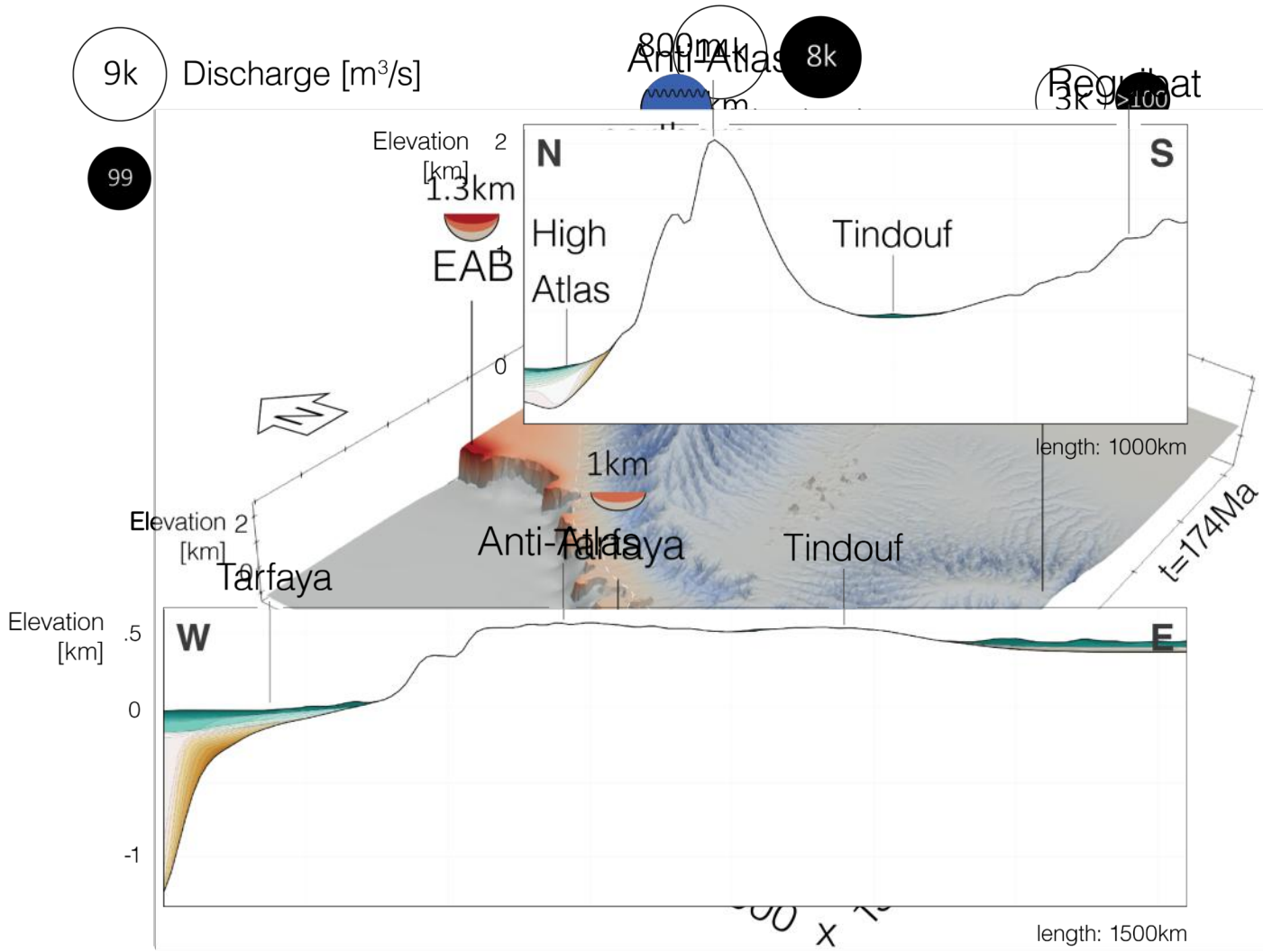
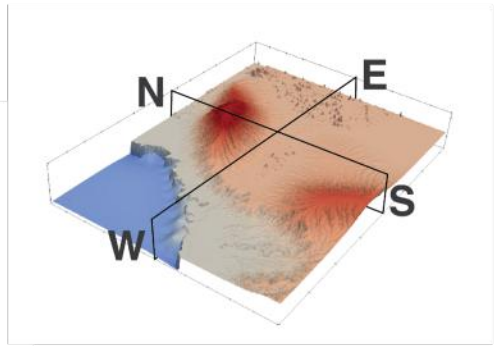
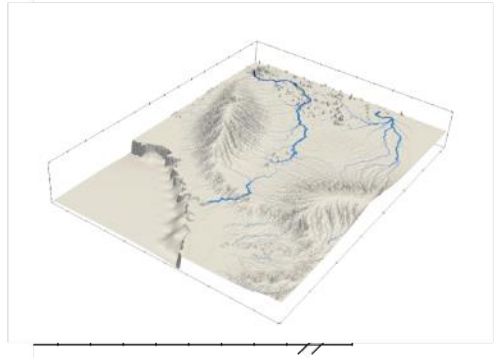
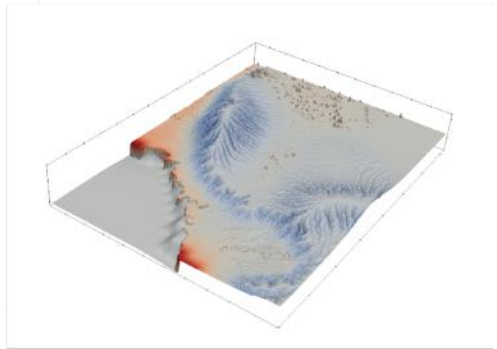
2 | eJ: bulging Anti-Atlas









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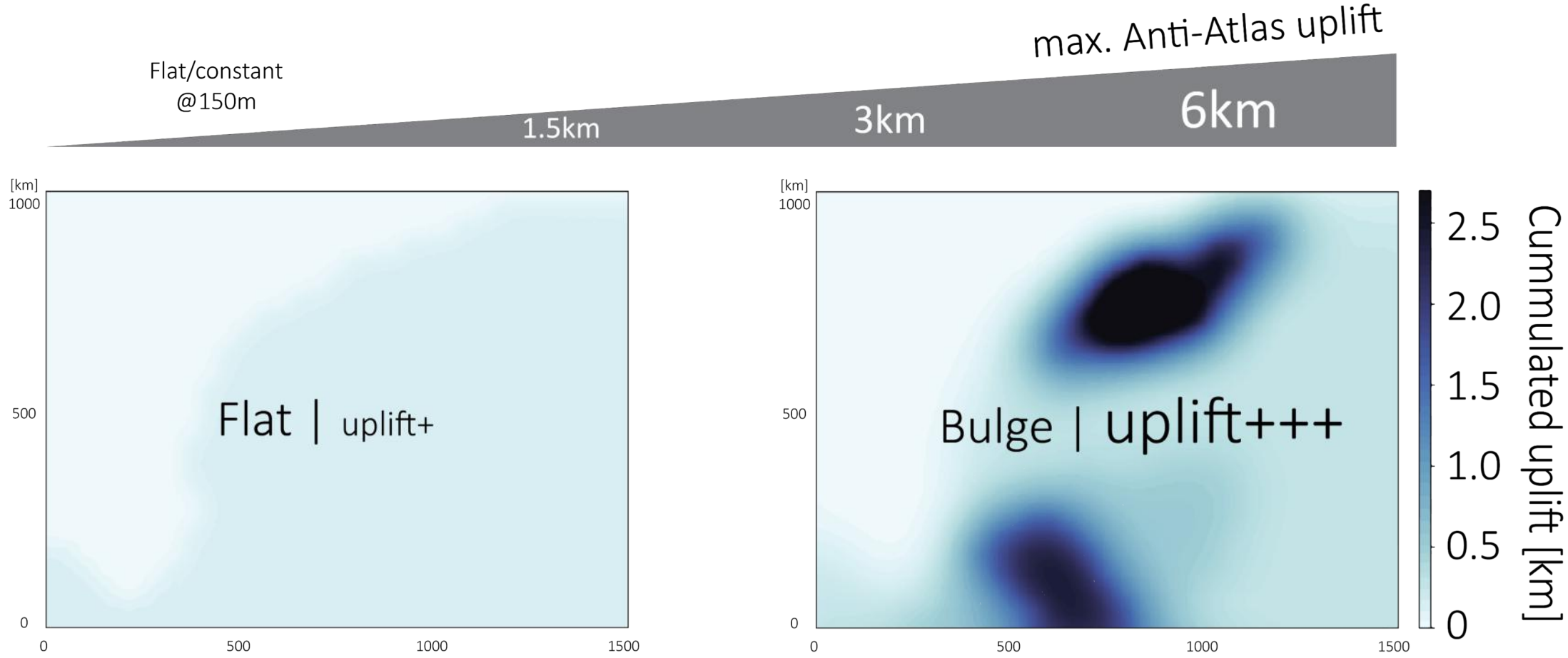
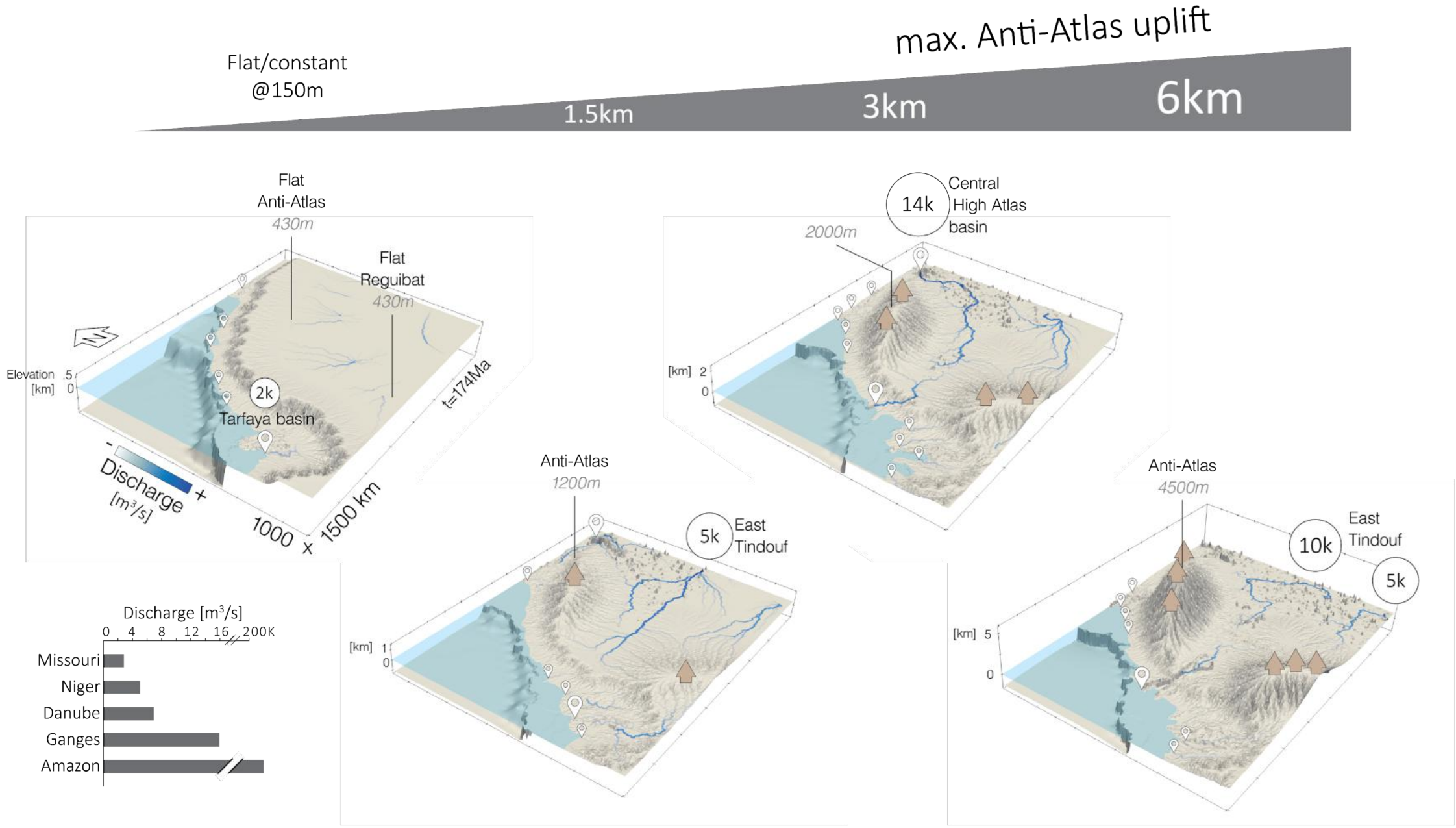
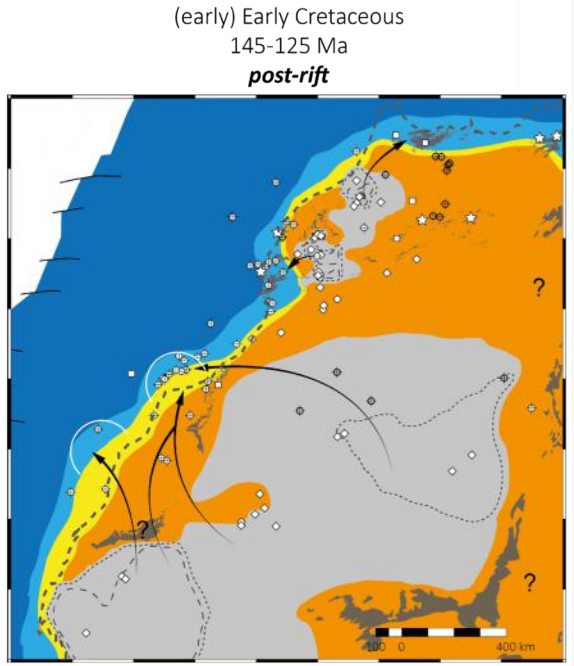
eJ: Slow vs. fast uplift

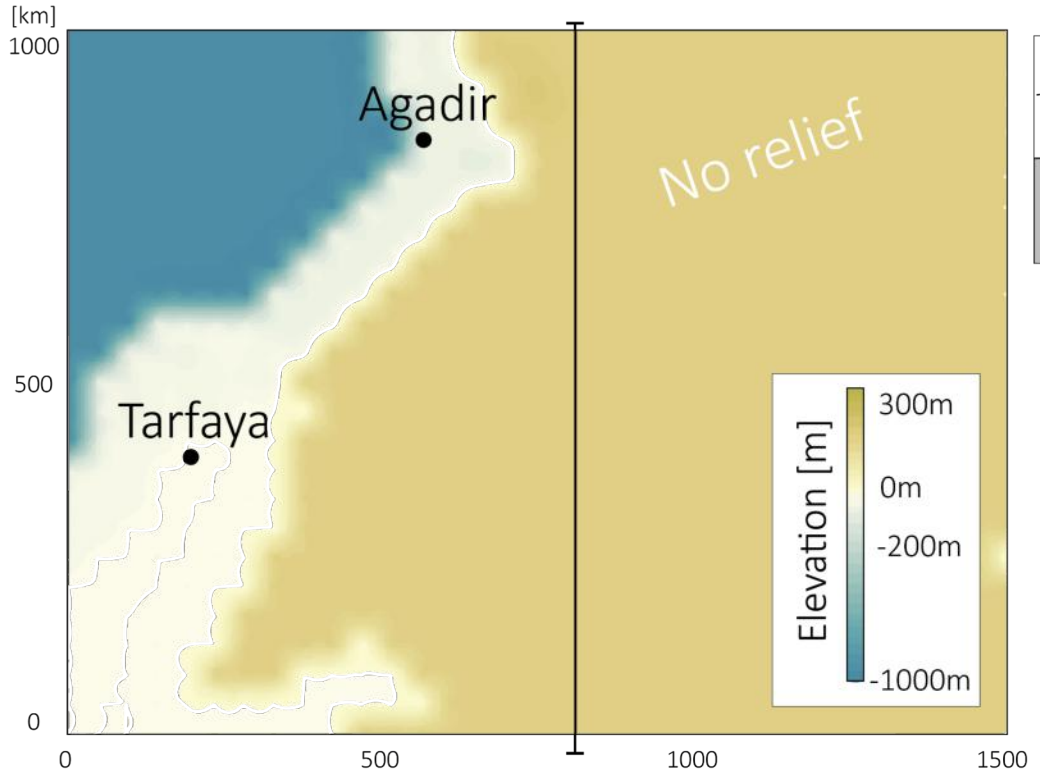


eJ: Slow vs. fast uplift



3 | Early Cretaceous (eC): Setup design





↑ *Simplified tectonic scenario*
← *Initial topography map*
↓ *Other inputs*

Grid	Model	Boundary	Run time
5x5km	1000x1500km	Flat	145-125Ma

Sea level	Rain	Flexure	Waves
literature	literature	On	Off

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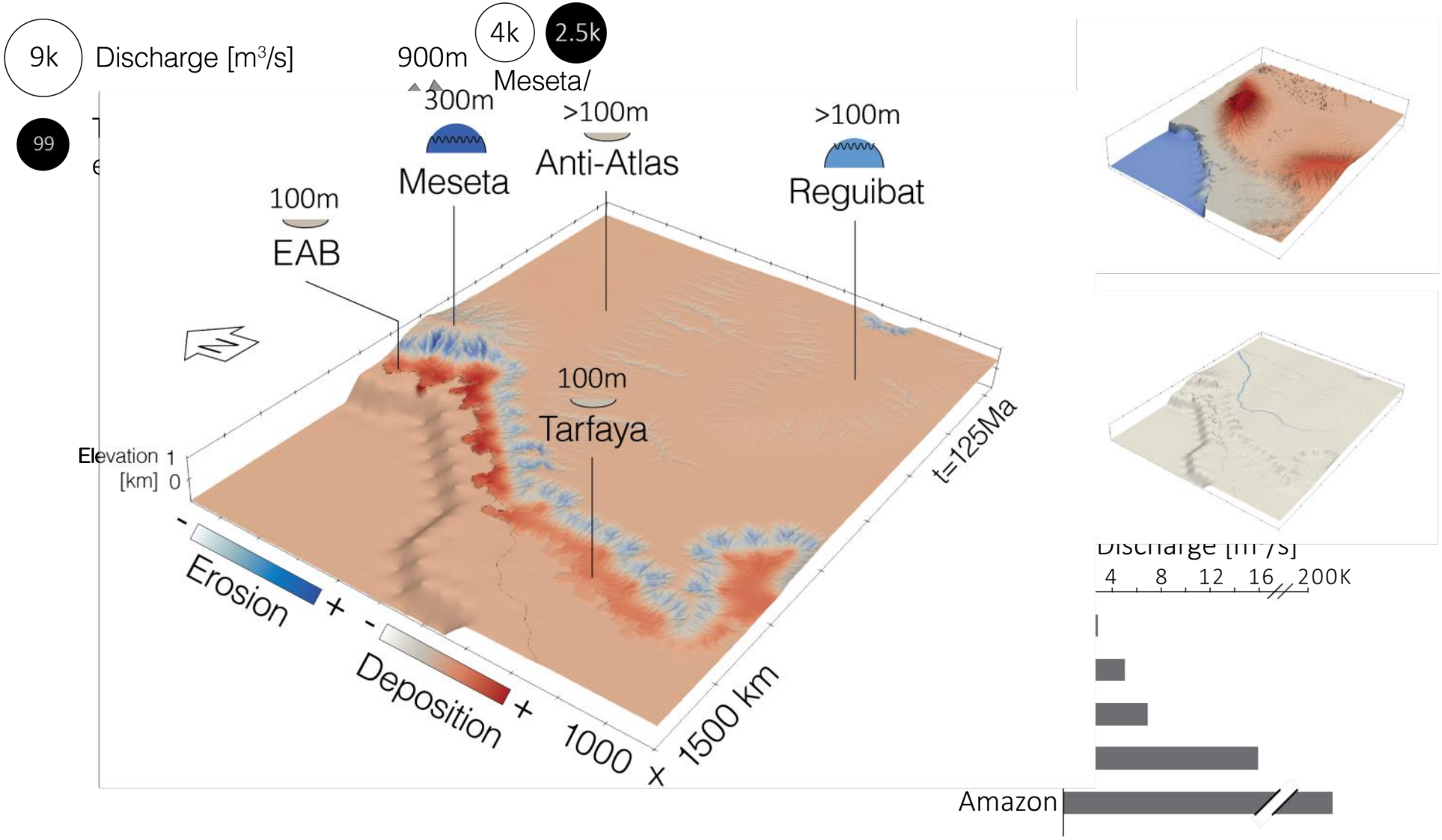
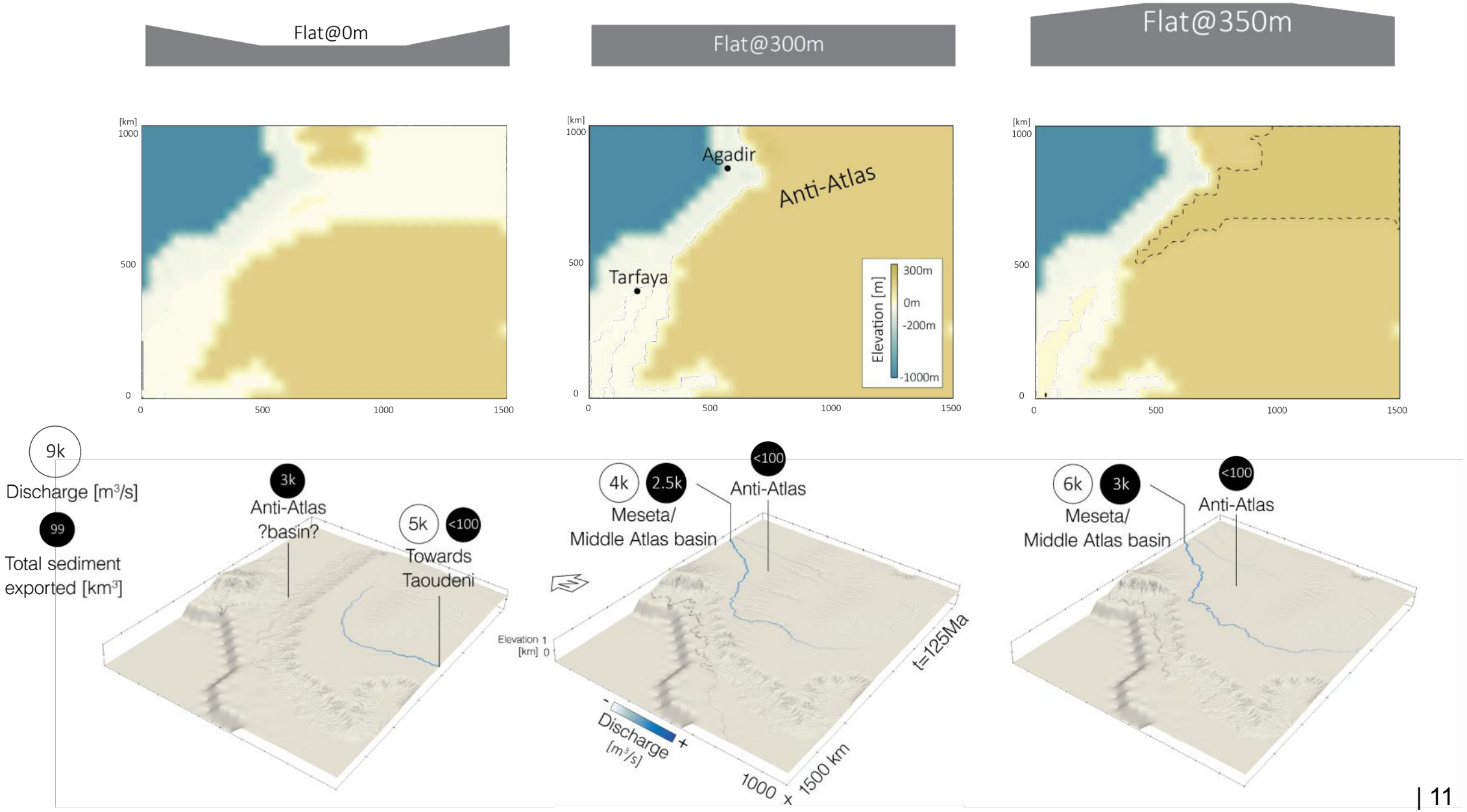
eC: Covered Anti-Atlas?



eC: the impact of initial topography?



•••• | Predictions for HC exploration in Morocco

Early Jurassic

- Anti-Atlas topography was likely marked by a bulge, dividing the region in several drainage basins.
- Important siliciclastics must have been shed into the Tarfaya basin; around latitudes 25-26°N in our models.

Early Cretaceous

- A paleo-drainage from the Reguibat Shield transporting material northward, further than the Anti-Atlas (>1000km), is conceivable; as already suggested by Azdimousa et al. (2019, in Gondwana Research).
- Only when the Anti-Atlas elevation is lower than its surroundings may it collect enough sediment to match LTT and t-T data. In such case the long drainage system is unlikely.

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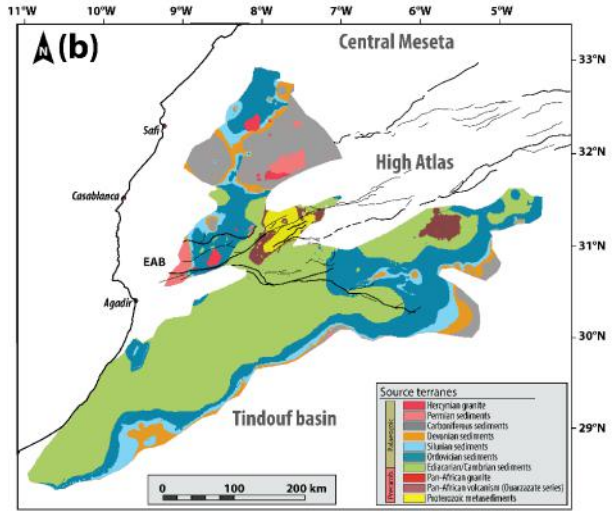
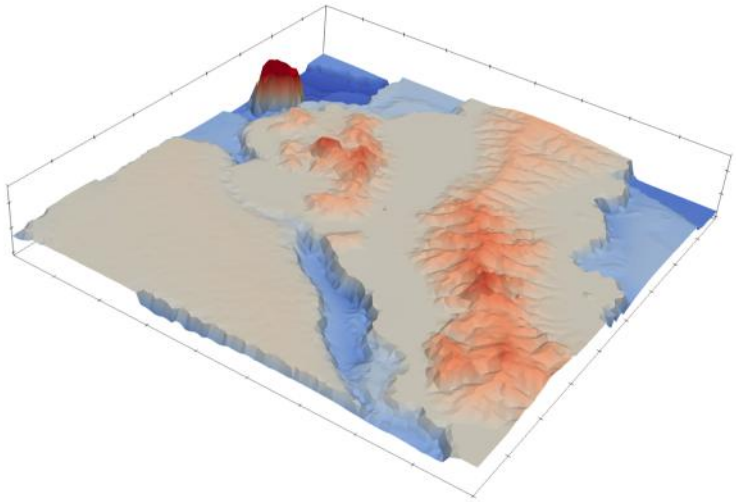
•••• | Future work

- Get uplift before running pyBADLANDS based on a model including literature-based climate, erodibility, and transport capability.
- Use Emmanuel's paleo-geological maps as a proxy for erodibility.
- Include tectonic subsidence from wells in the interpolation with uplift.
- Run ONE model from Permian to Present-day discarding the need for several initial topography maps.
- Use well and seismic data to compare models with volume of siliciclastics deposited.





Roquette et al., in prep.

| Project

| Research group

| Special thanks