

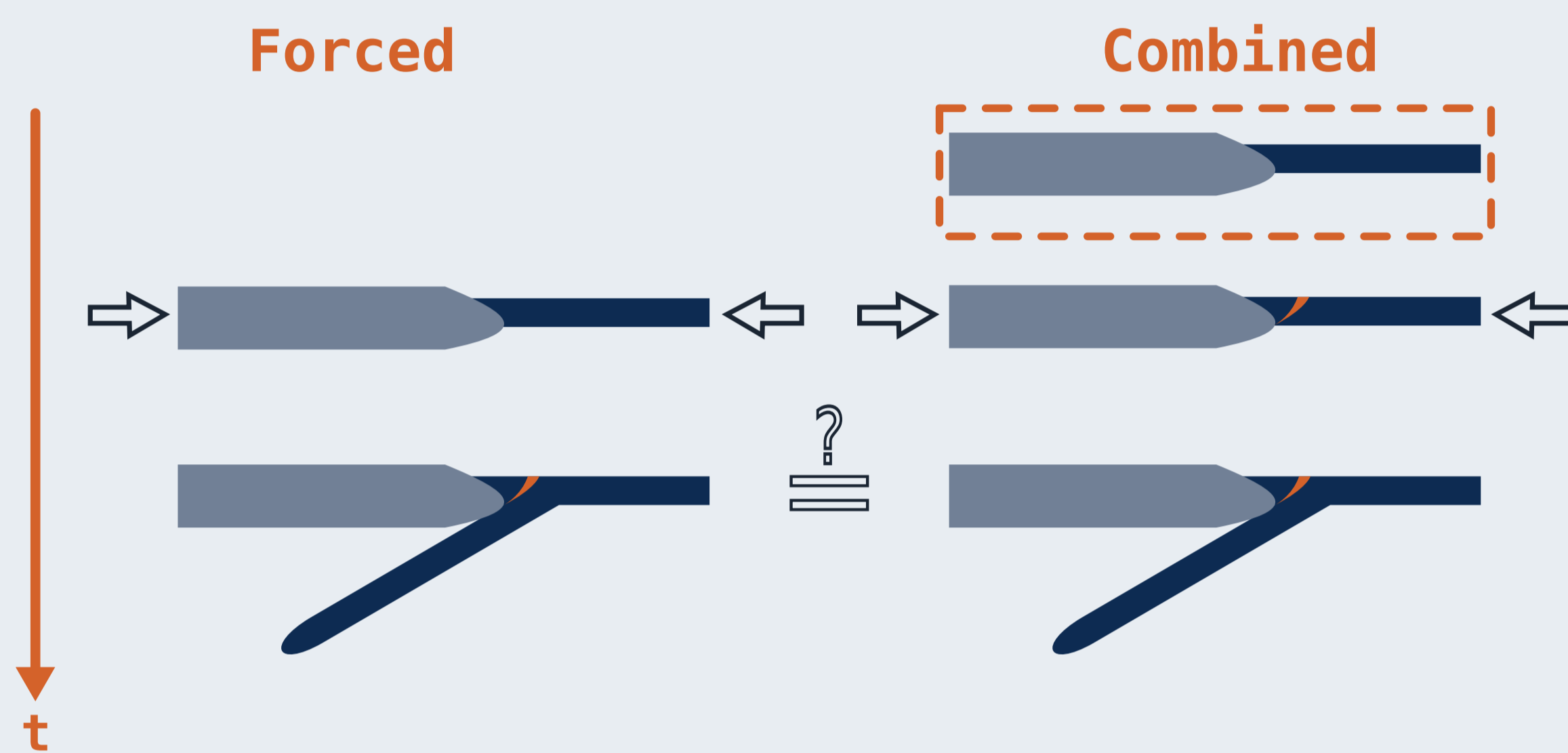
# Preconditioning of subduction zone initiation at passive margins by gravitational instabilities

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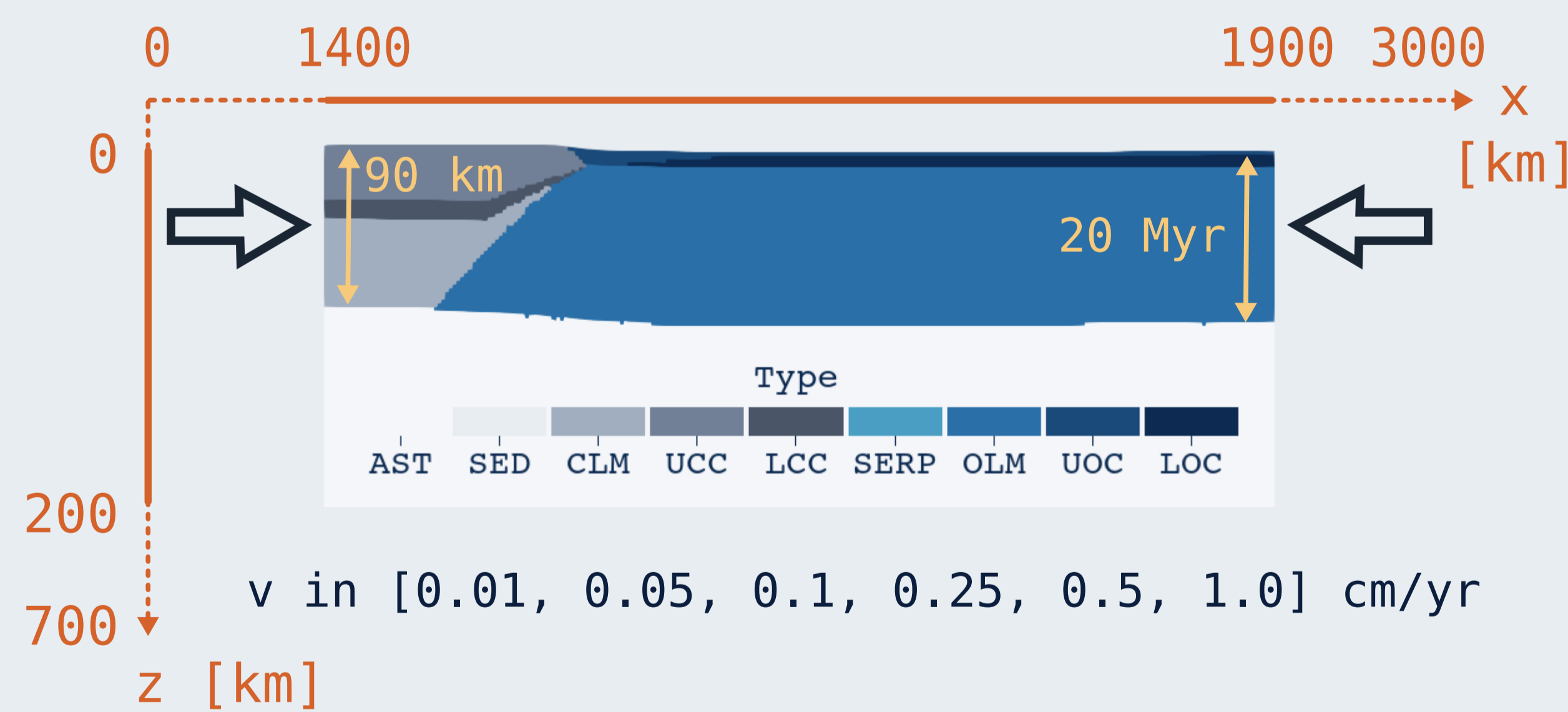
EGU26-4050

Passive margins are characterised by strong lateral contrasts which may generate gravitational instabilities capable of locally weakening the lithosphere.

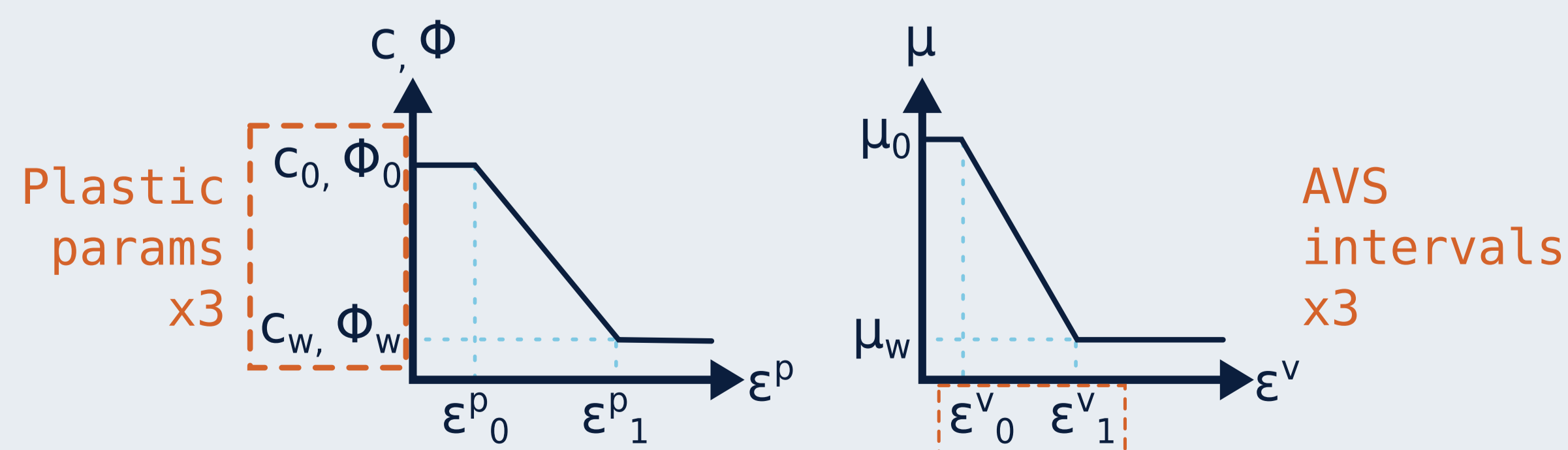


Can the gravitational instabilities at passive margins act as a preconditioning mechanism for subduction, facilitating induced SZI once convergence is applied?

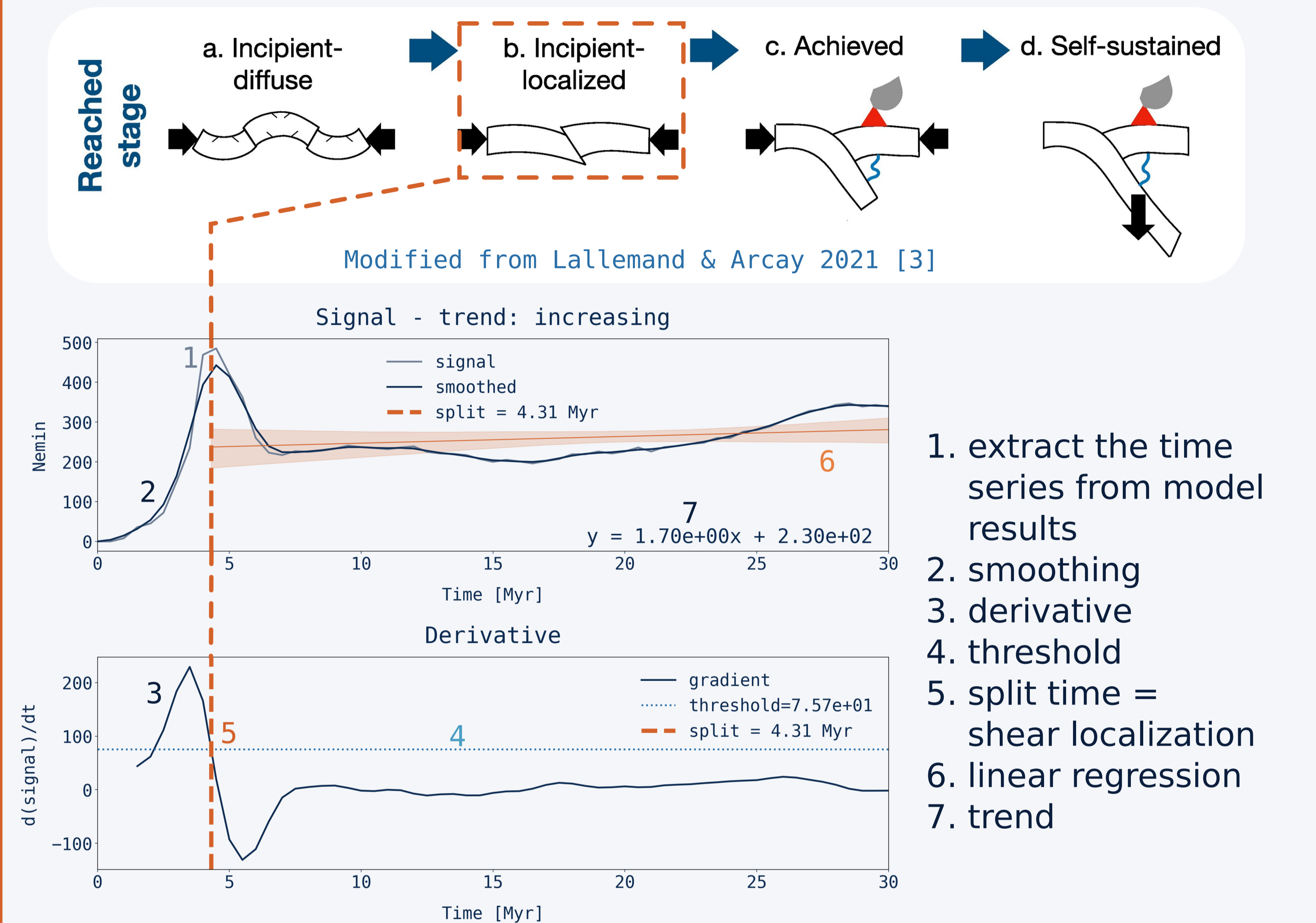
To address our question we performed 225 two-dimensional, viscoplastic, thermo-mechanical simulations using the finite-element code FALCON [1]



To systematically explore lithospheric weakening, we vary both viscous and plastic softening laws [2]

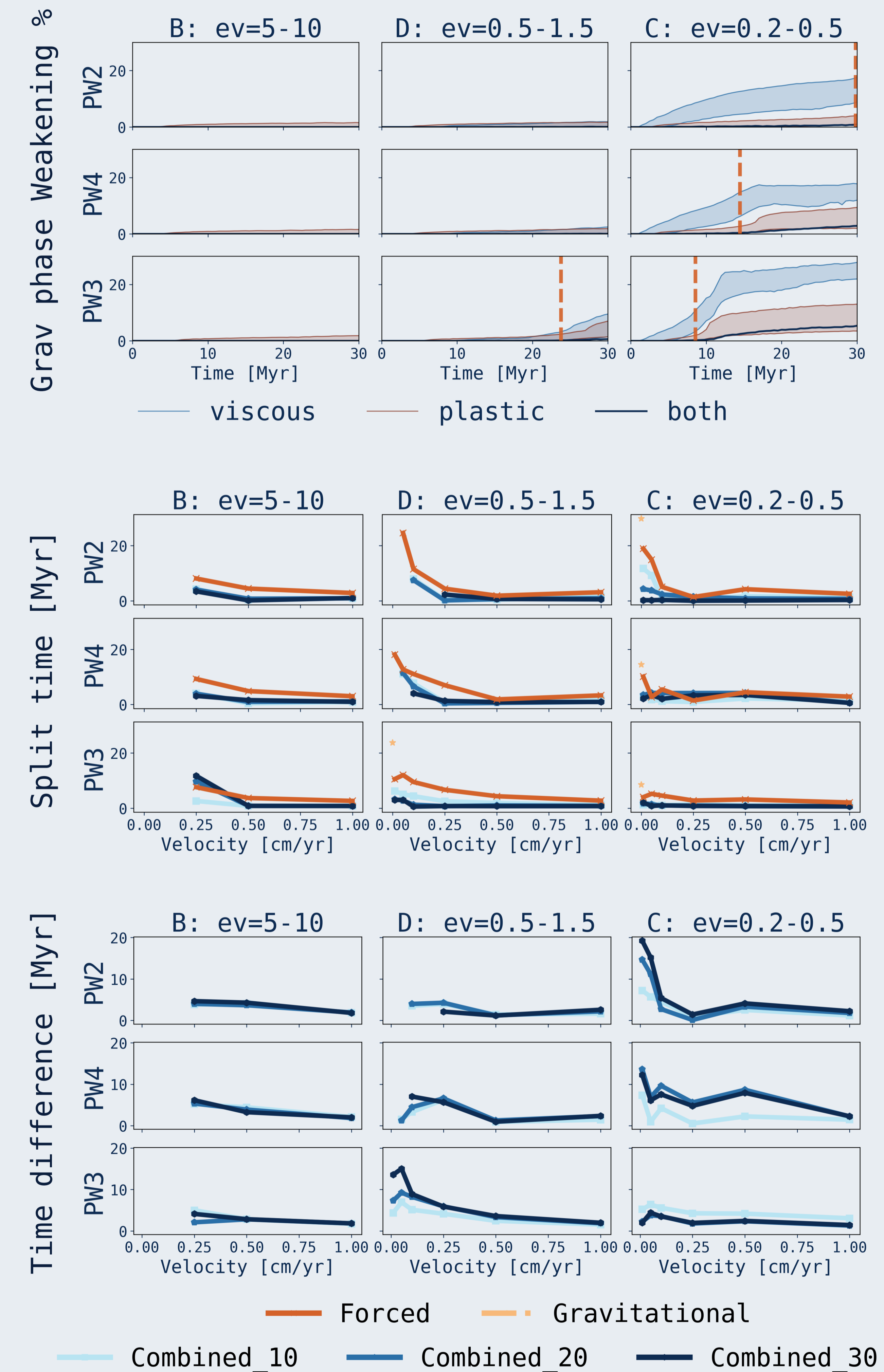
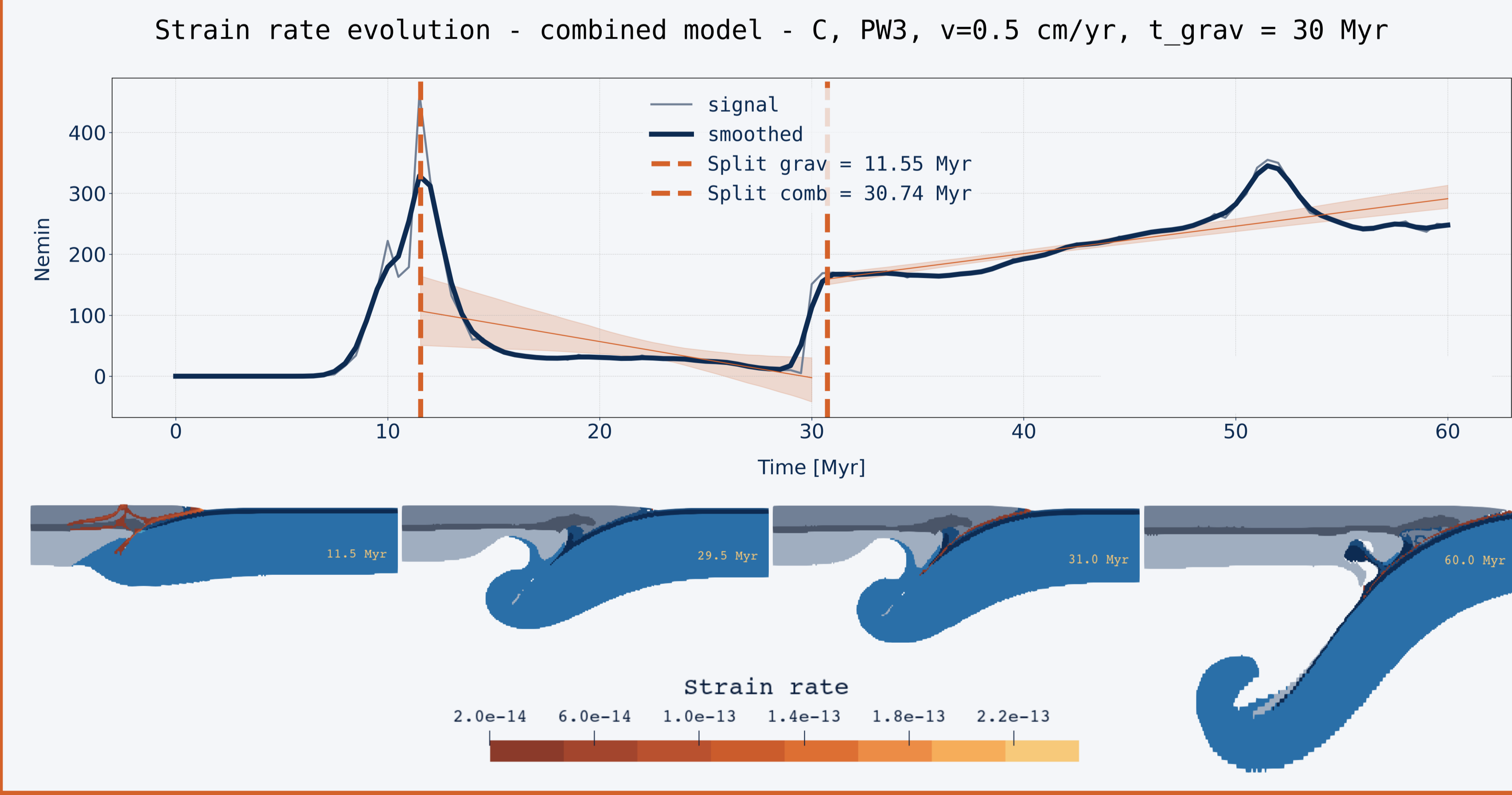


## HAS THE SUBDUCTION STARTED?



1. extract the time series from model results
2. smoothing
3. derivative
4. threshold
5. split time = shear localization
6. linear regression
7. trend

If the trend is increasing, the split is the subduction zone initiation time, otherwise it is only the shear localization time



For sufficiently weak configurations, gravitational instabilities lead to strain-rate localization within the passive margin. The mechanically damaged zone may be reactivated when convergence start, and the subduction initiates earlier.

[1] Regorda et al. 2023, "Rifting Venus: Insights From Numerical Modeling"  
 [2] Huisman and Beaumont, 2003, "Symmetric and asymmetric lithospheric extension: Relative effects of frictional-plastic and viscous strain softening"  
 [3] Lallemand and Arcay 2021 "Subduction initiation from the earliest stages to self-sustained subduction: Insights from the analysis of 70 Cenozoic sites"