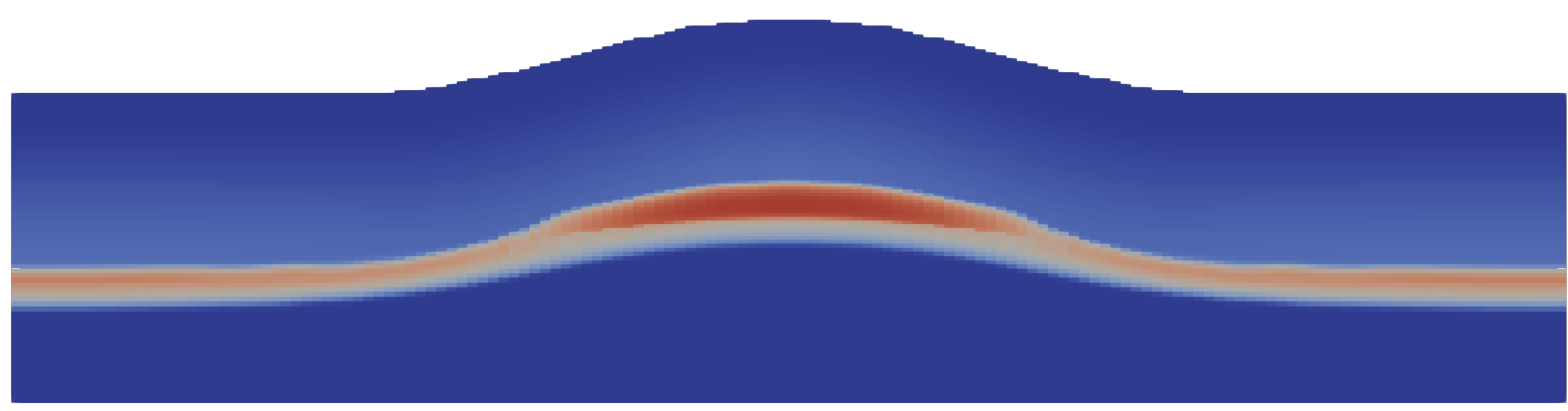
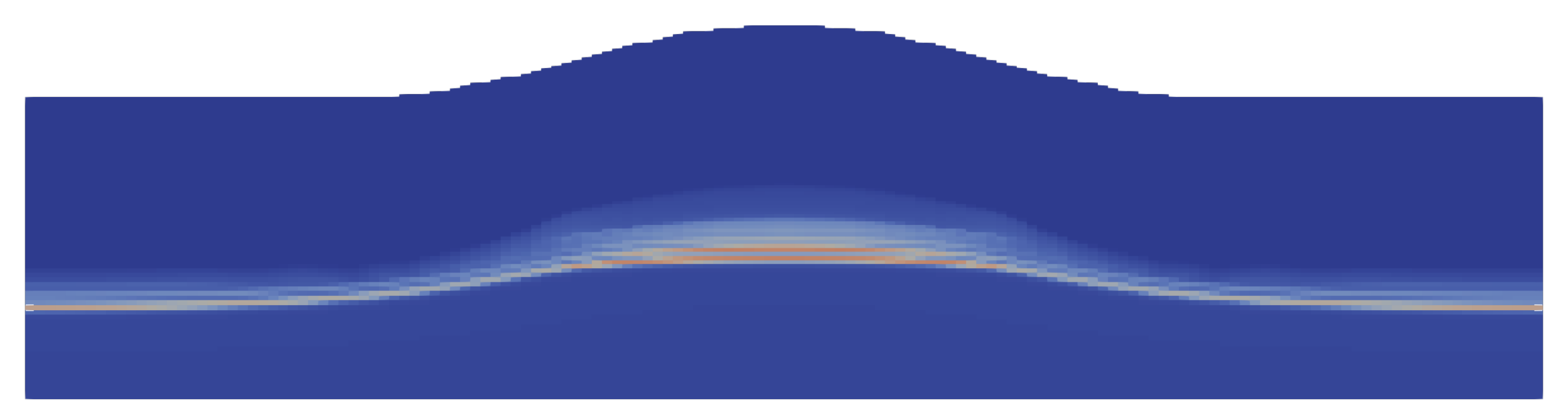


2D: Gas supply+sedimentation +organic matter

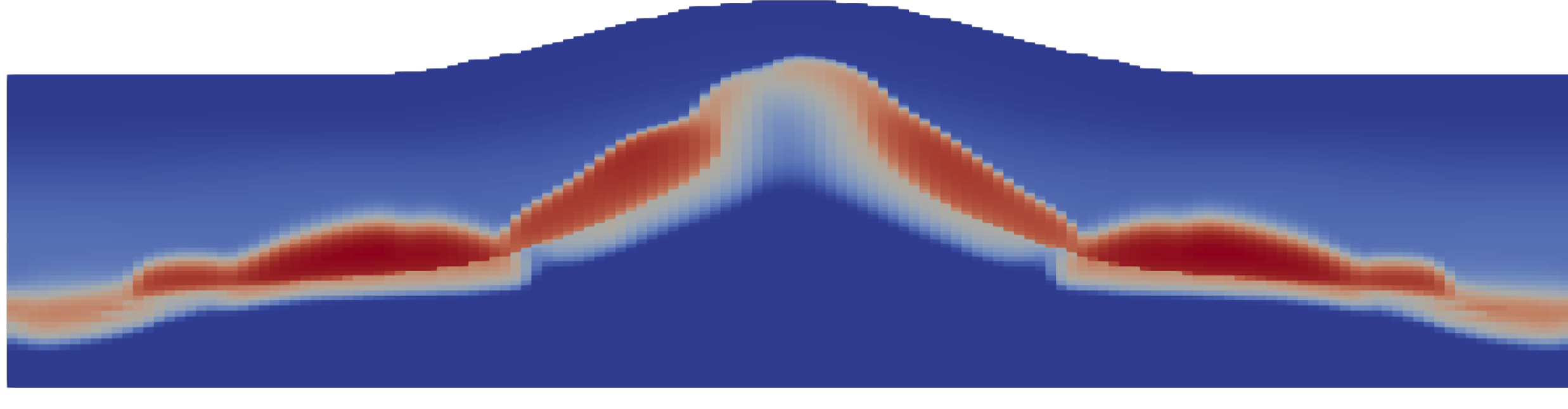
For scenarios showing periodic behavior, the model shows very rich internal dynamics under topographic gradient, where the spatiotemporal instabilities manifest as periodically focused flow.



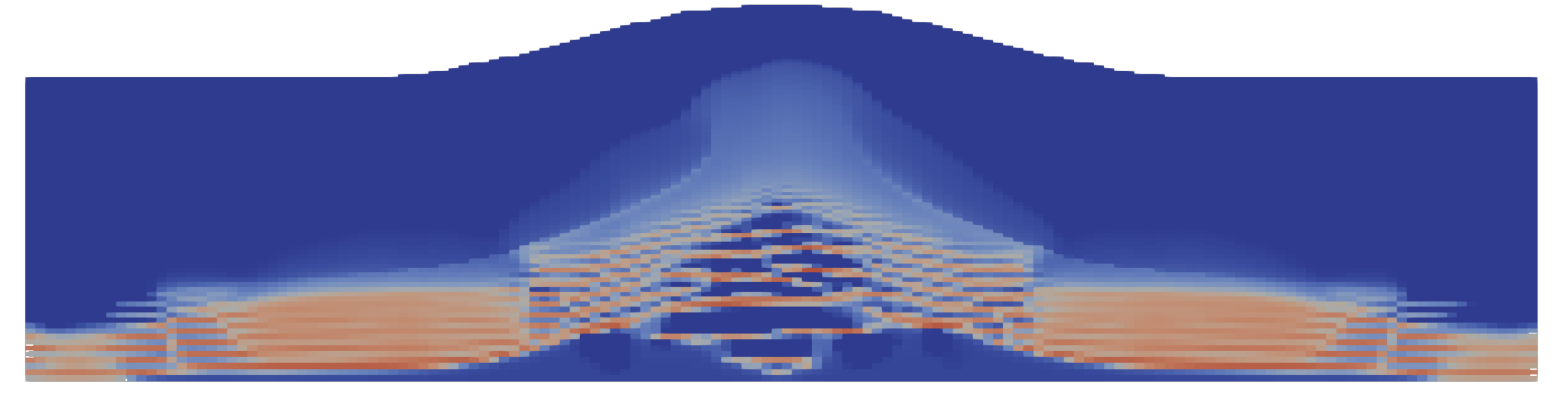
Hydrate distribution (before cycle)



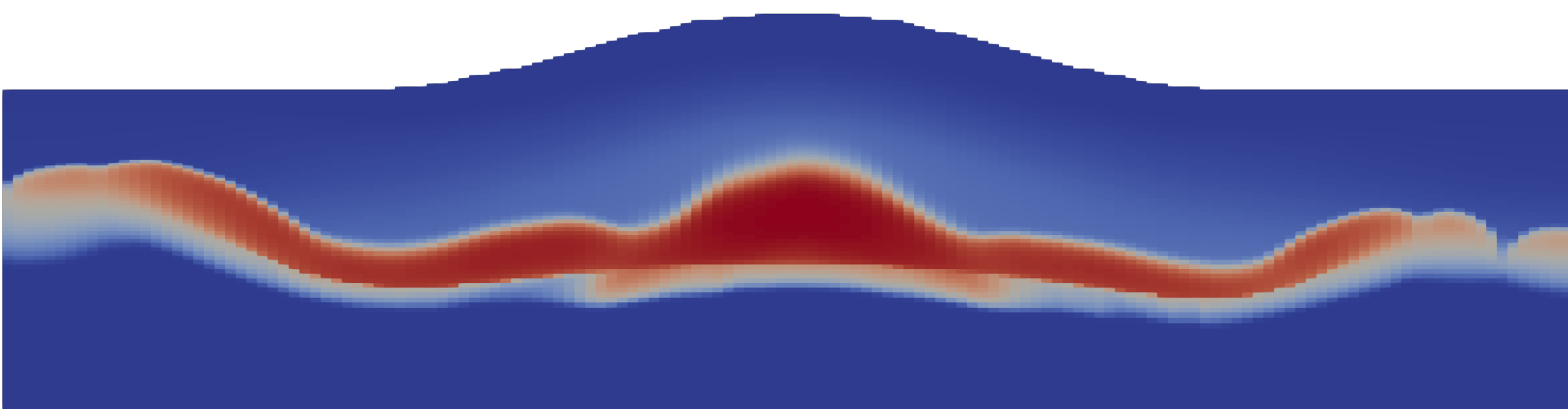
Gas distribution (before cycle)



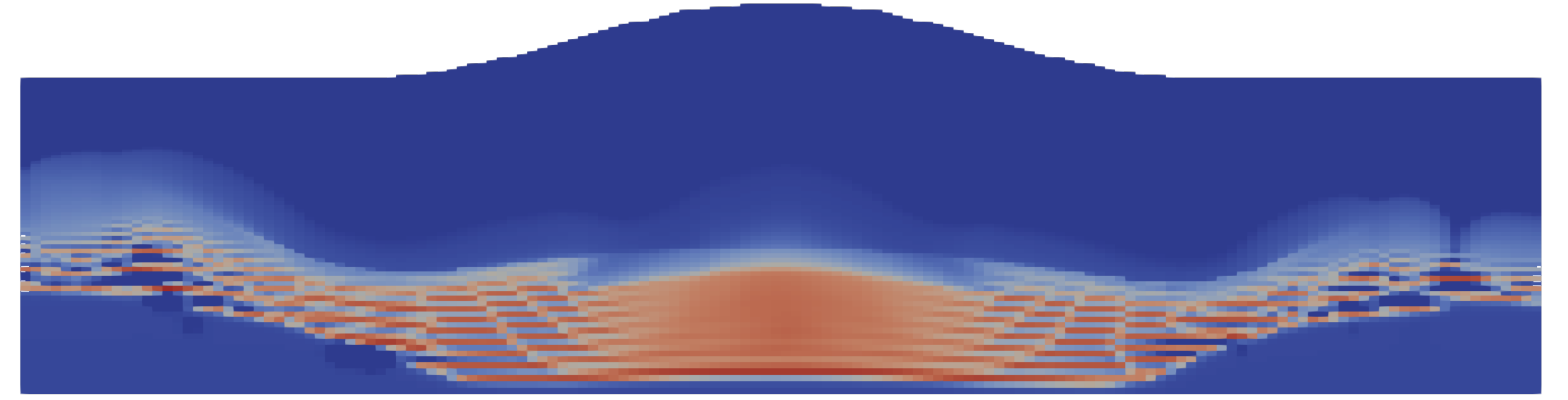
Hydrate distribution (during cycle)



Gas distribution (during cycle)



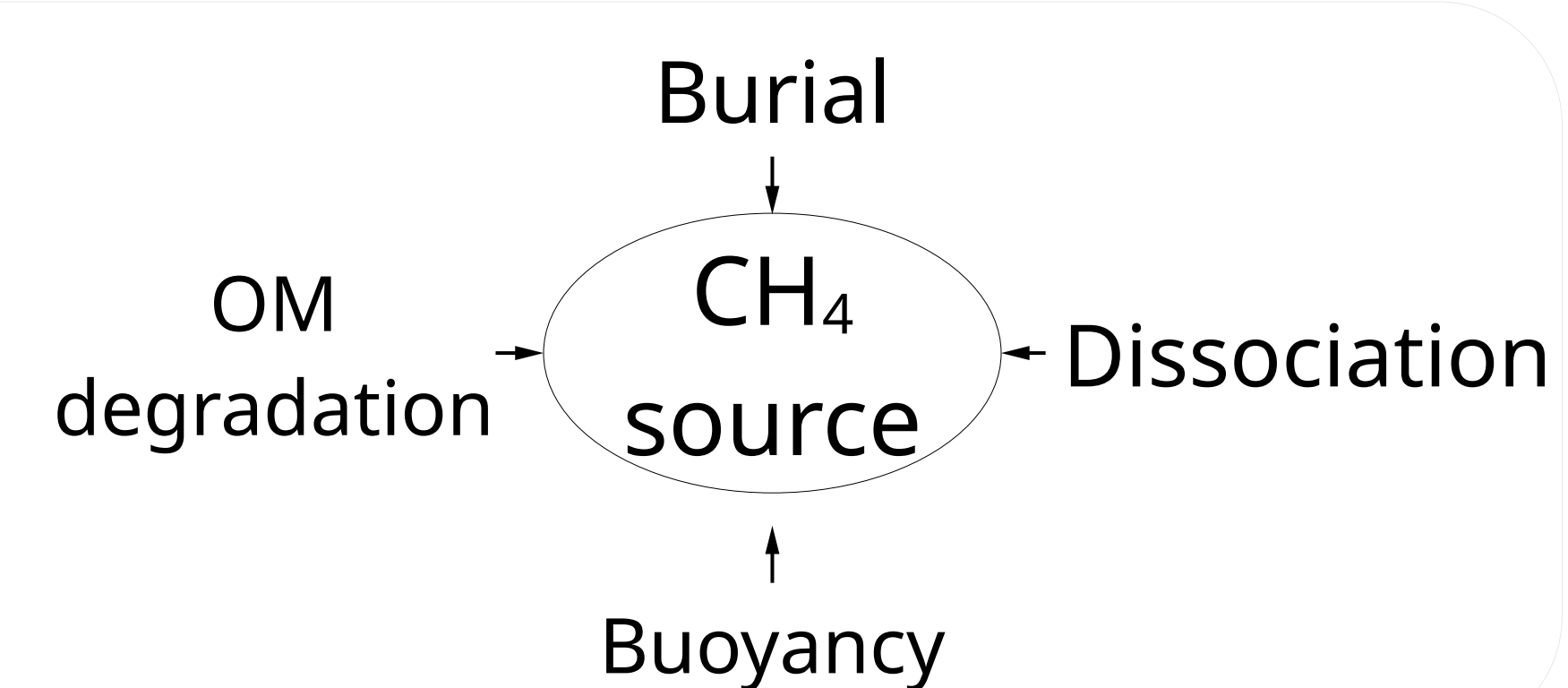
Hydrate distribution (during cycle)



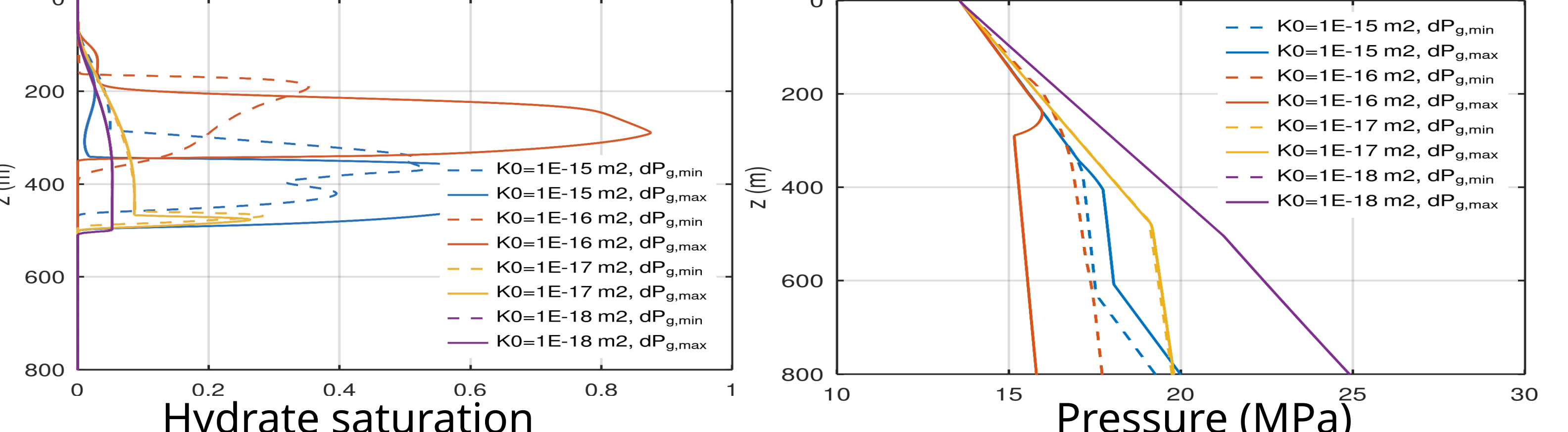
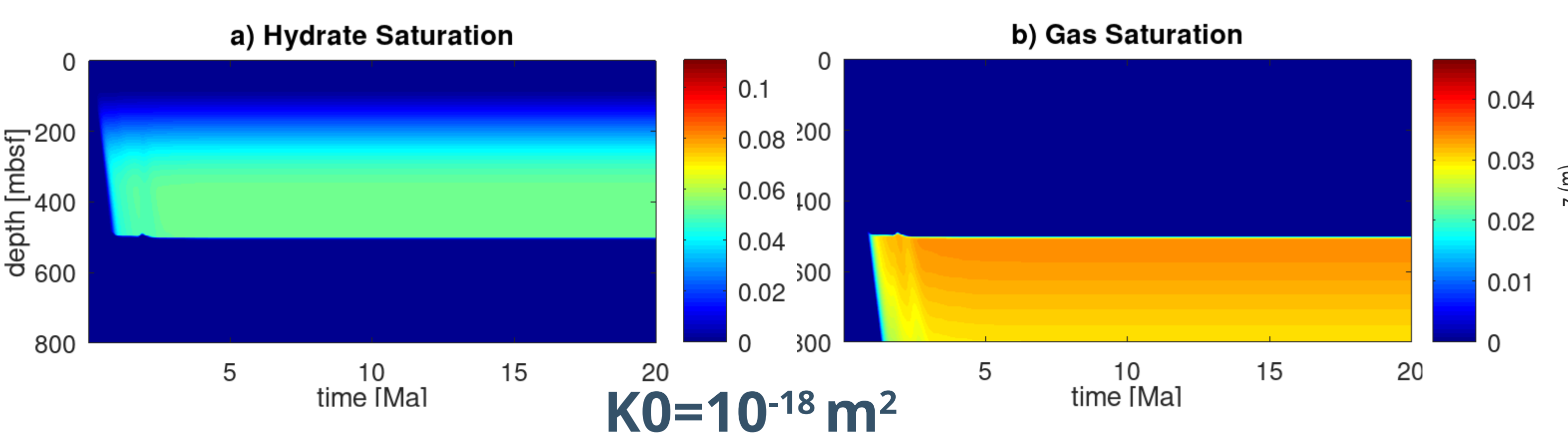
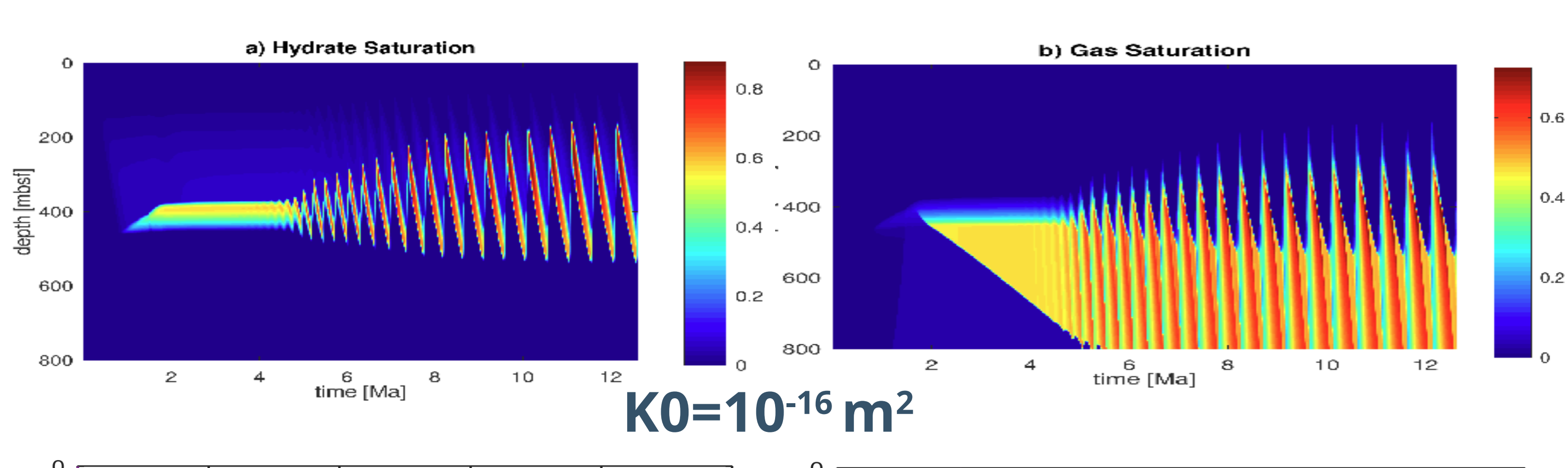
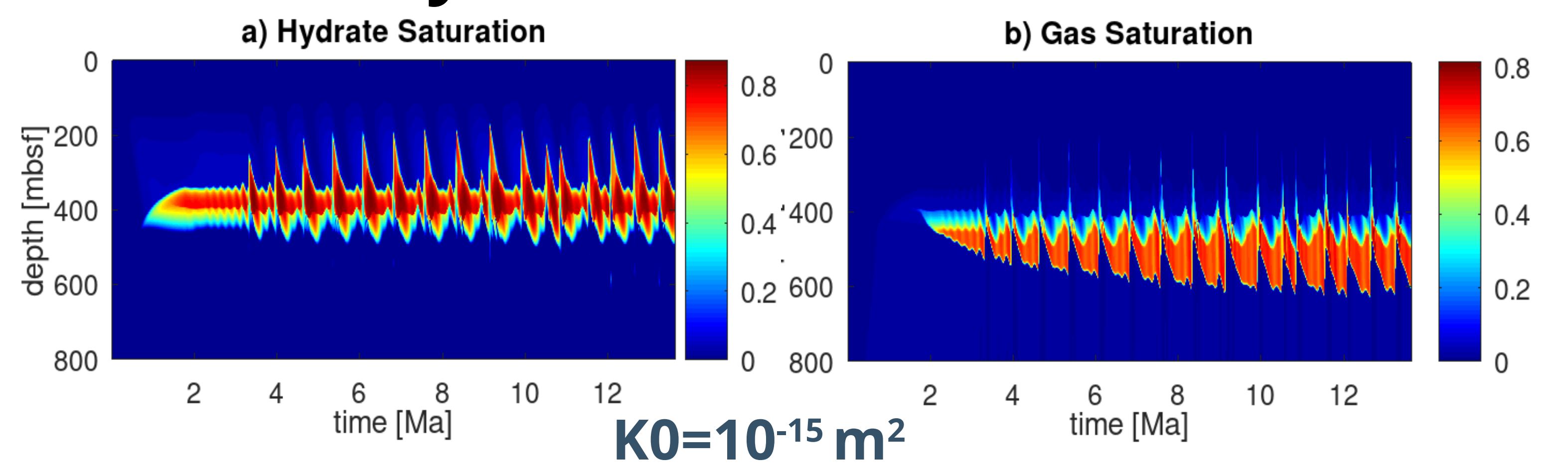
Gas distribution (during cycle)

Sensitive analysis

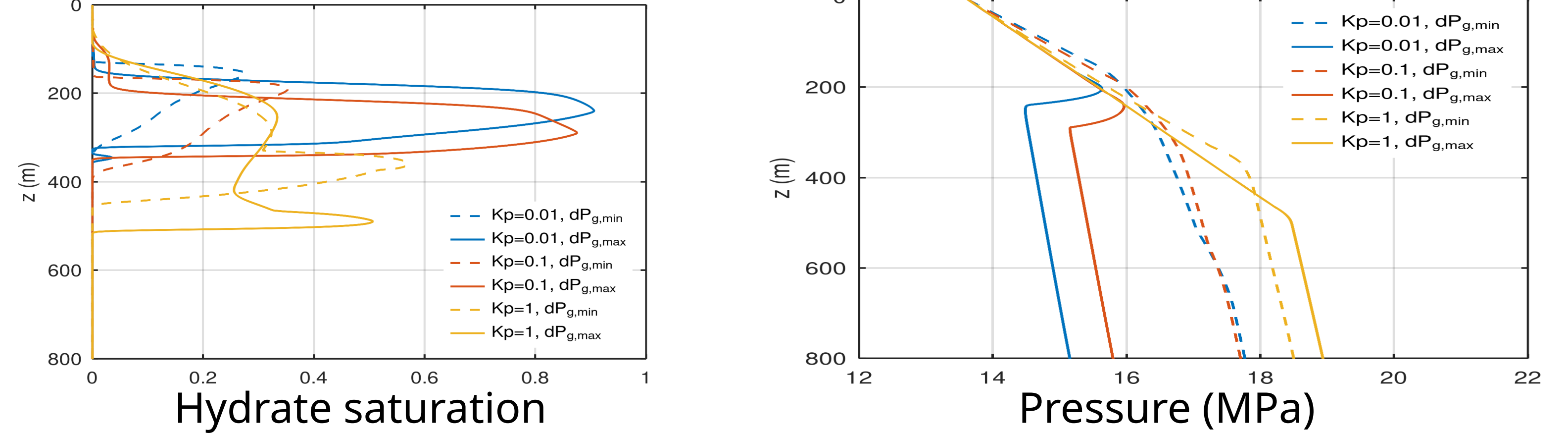
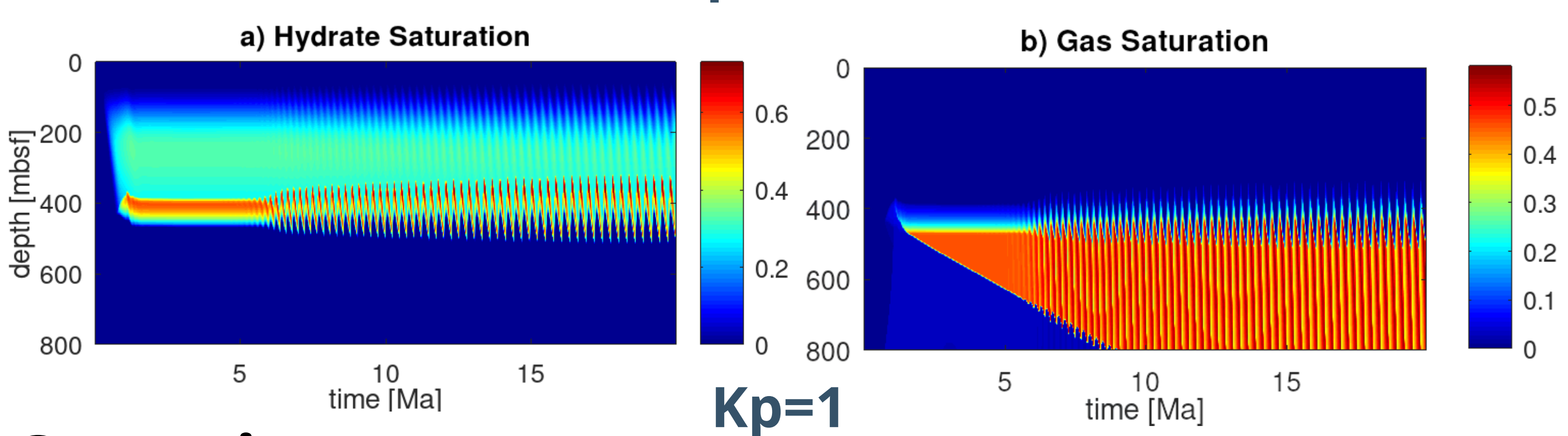
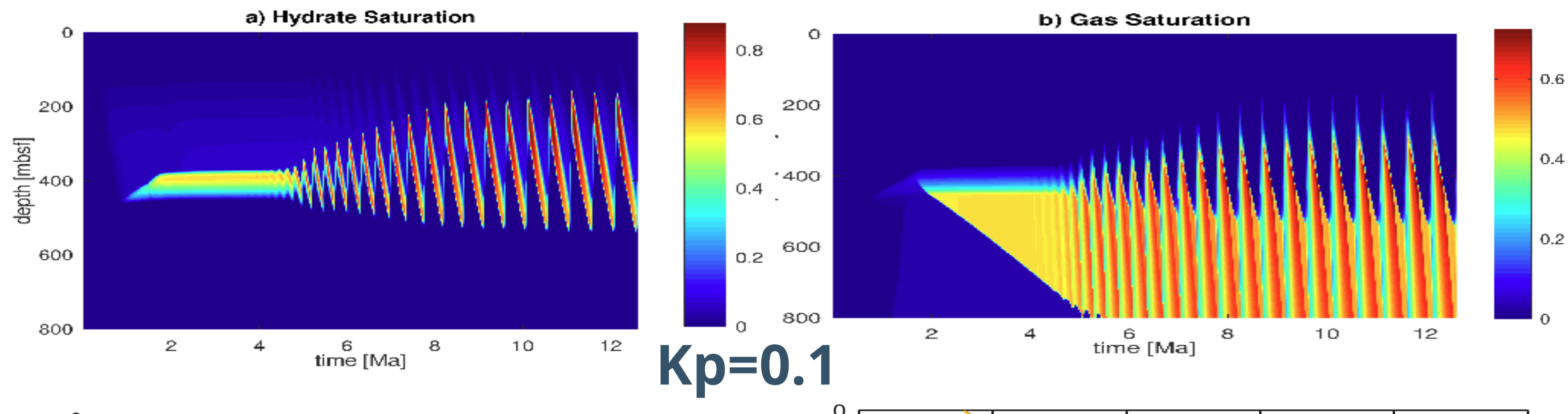
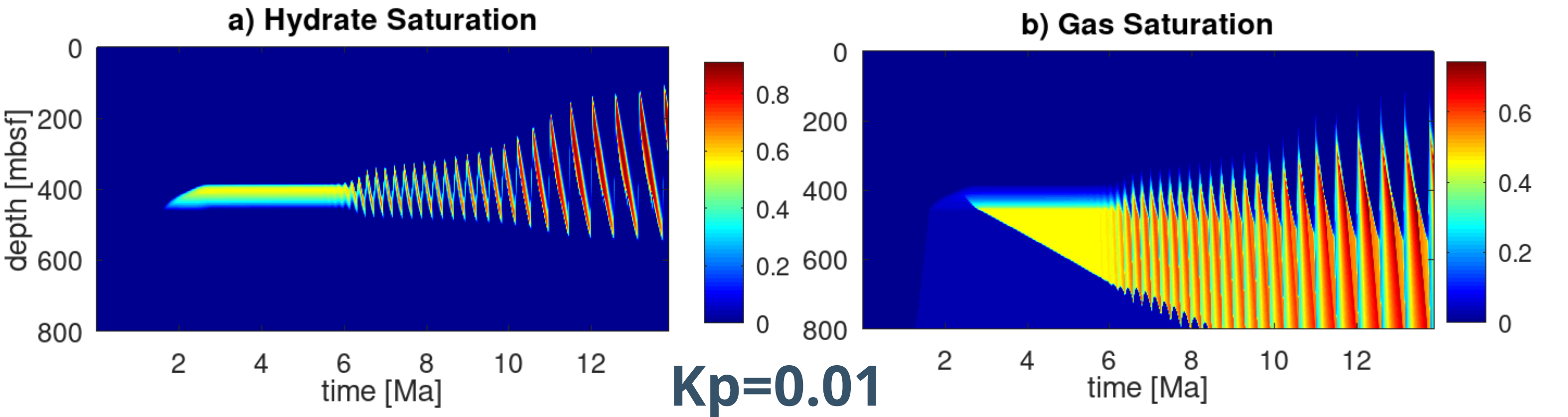
Sedimentation buries CH_4 from organic matter to depth, while buoyancy-driven flow promotes its upward migration, which is strongly controlled by permeability. The periodic hydrate dynamics are governed by the competition between these two driving mechanisms.



Permeability



Precipitation Rate



Organic matter

