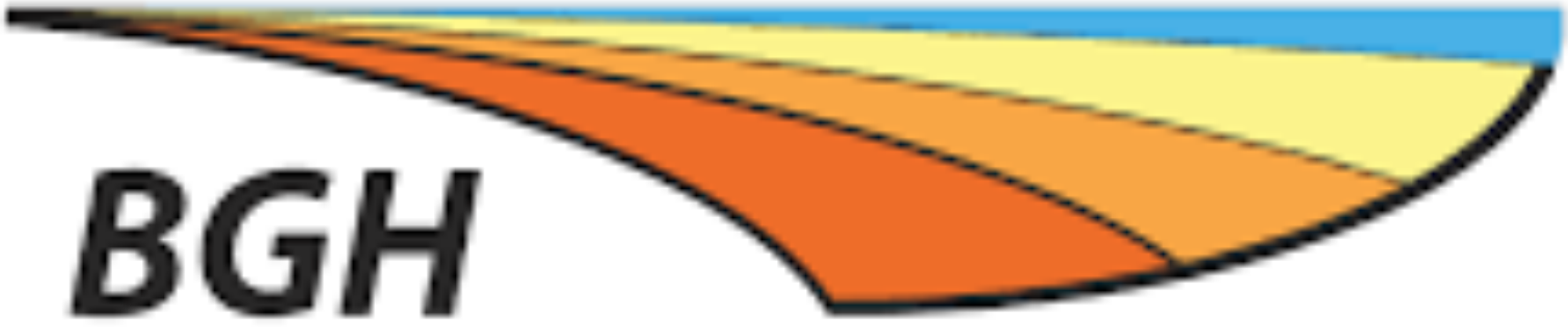

BGH

Earth System Evolution

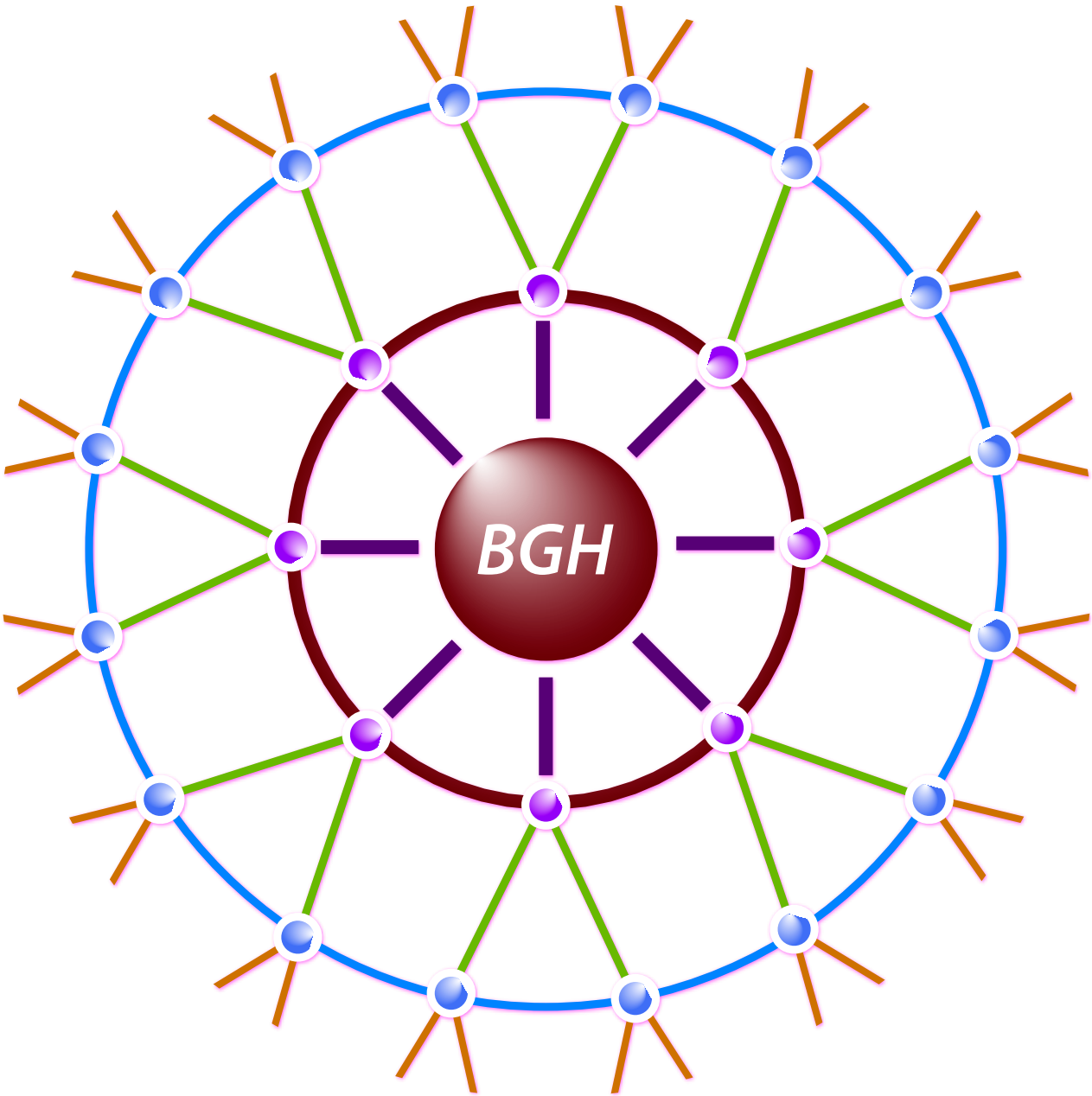
- Our knowledge about Earth's evolution usually compartmentalises the study of Earth's surface processes, tectonic plates, and the ductile deep interior

- How do deep Earth processes drive surface topography and environments through time?

- What can we learn from Earth's past and possible future paths from Earth modelling?

- We cannot observe the Earth back through time.

- Need to connect observations to 4D (space-time) geodynamic & surface processes models, in a plate tectonic context: need an "**experimental virtual Earth**"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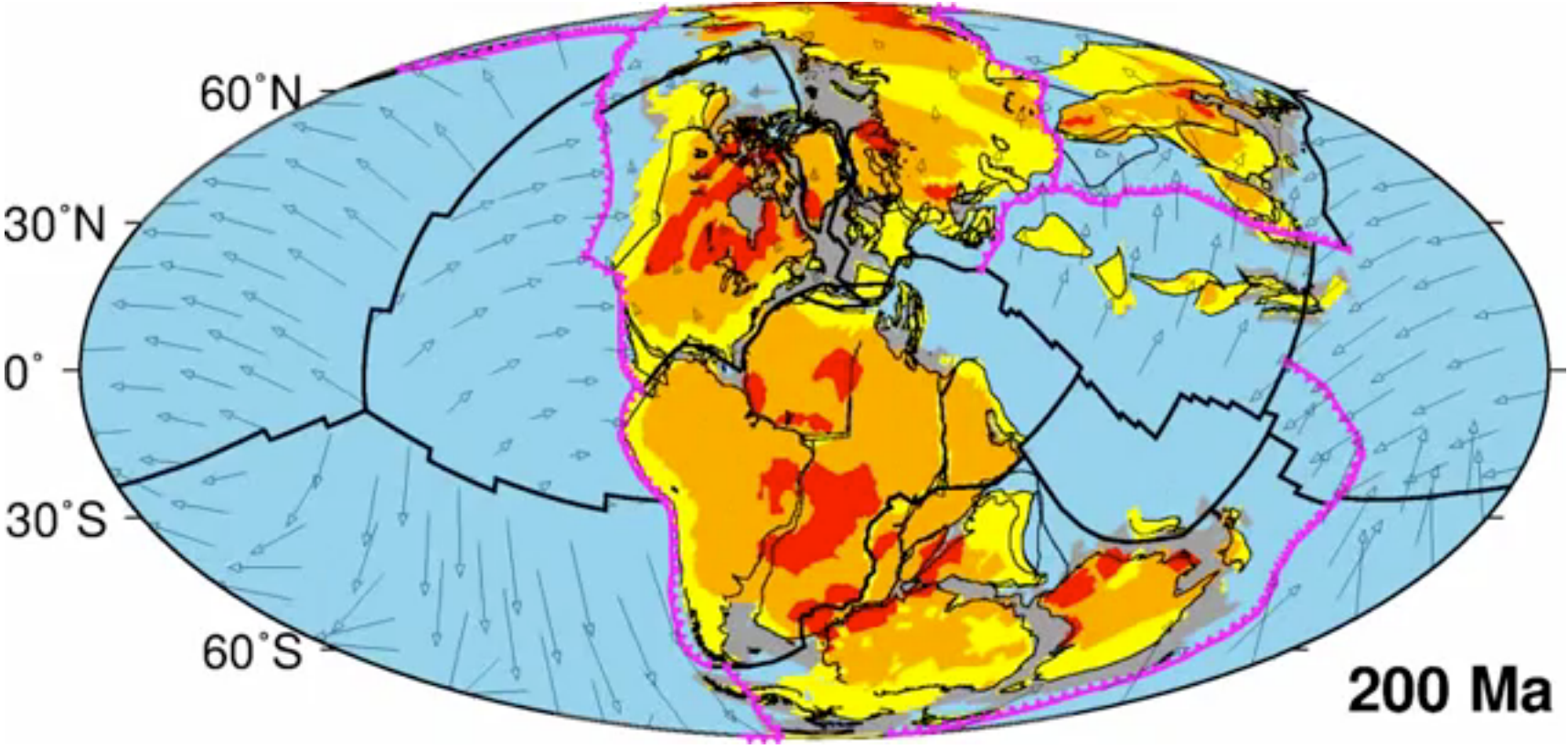
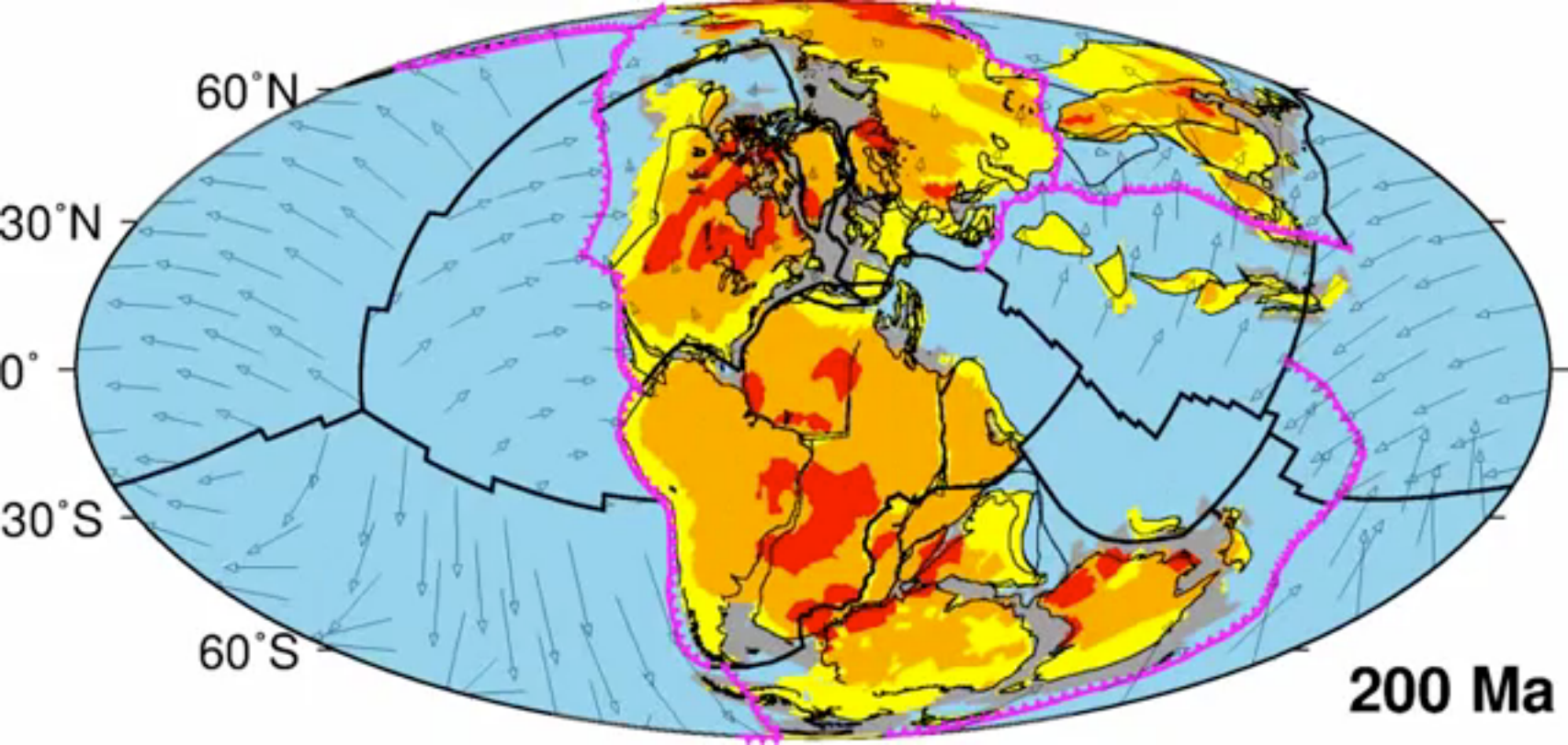

60˚N
30˚N
0˚
30˚S
60˚S
200 Ma

Zahirovic et al. 2015


60˚N
30˚N
0˚
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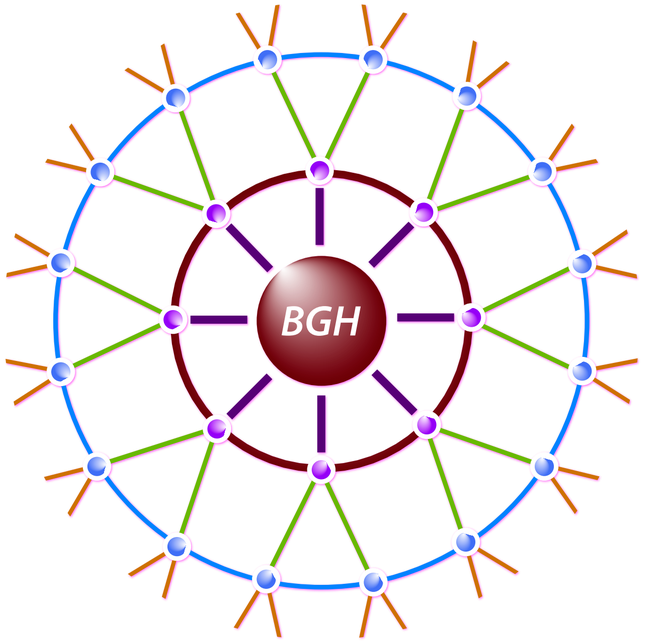
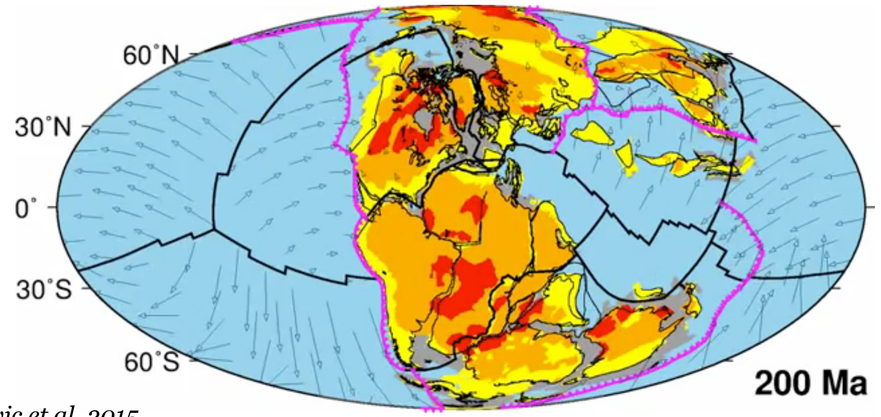
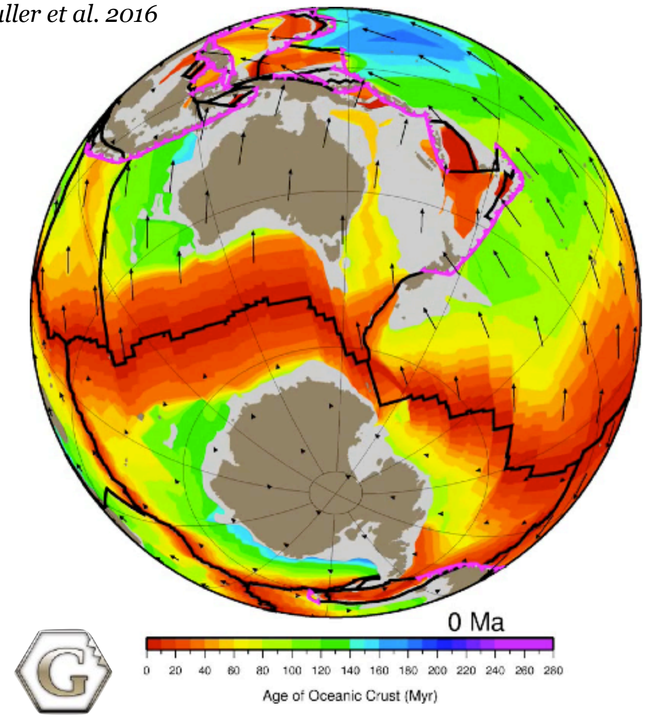




Zahirovic et al. 2015

Our Experimental Virtual Earth

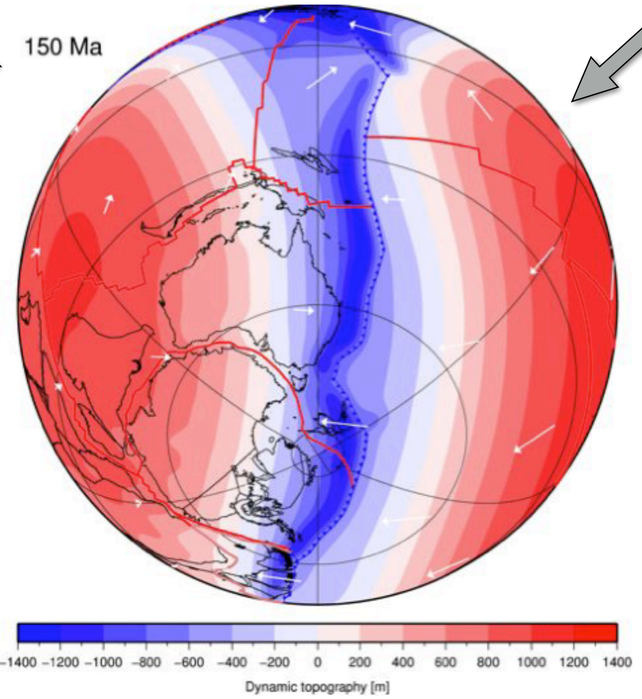
Muller et al. 2016

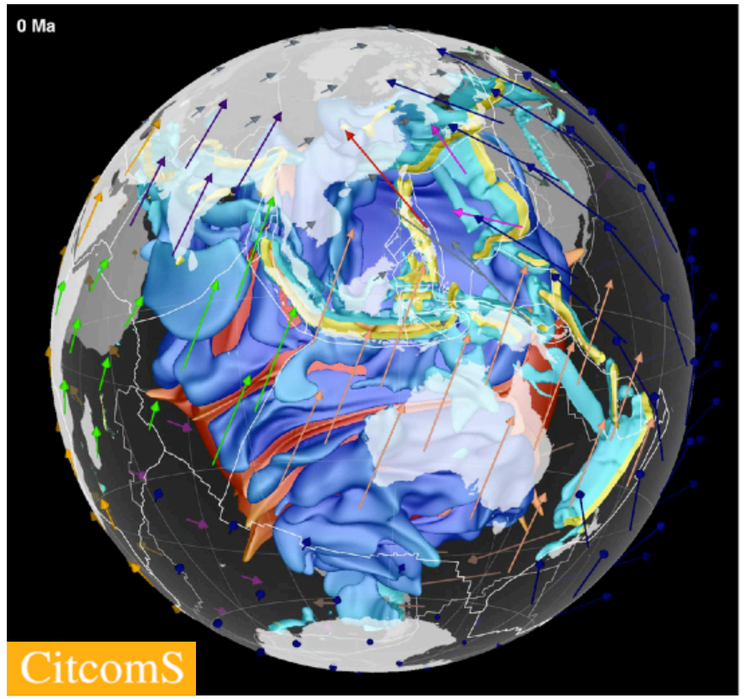


- Global reconstructions of tectonic plates & plate boundaries
- Provide surface boundary conditions for geodynamic models

- 3D spherical finite element mantle convection code
- Modified to read in tectonic reconstructions
- Mantle structure though time

Dynamic topography





- 40,000 CPU hours/model (200 Ma)
- 13×10^6 points assimilated through space & time

NCI

SAM AuScope simulation, analysis, modelling