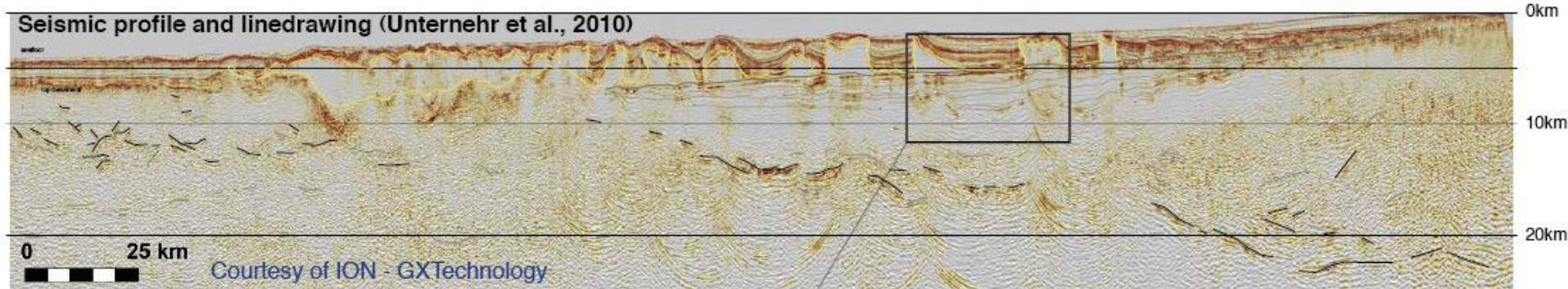
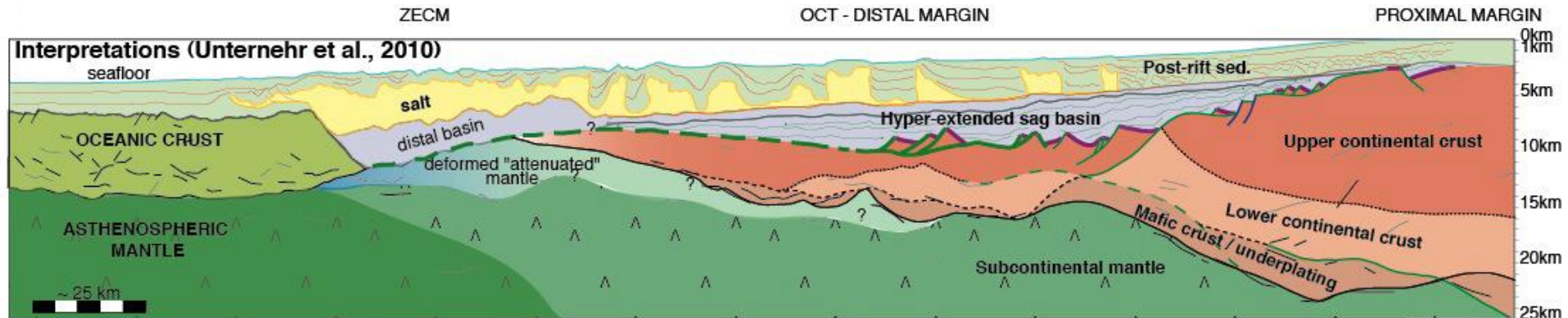




Passive Margin Structure Constrained by Geophysical Studies

Ricardo Trindade





INSTITUTO DE
ASTRONOMIA,
GEOFÍSICA
E CIÊNCIAS
ATMOSFÉRICAS



3 Departments:

Astronomy (31 faculty members)

Geophysics (20 faculty members)

Atmospheric Sciences (18 faculty members)

3 INCT-CNPq, 3 NAP-USP, 14 Fapesp Thematic projects
(1 SPEC-Fapesp)

345 undergraduate students (5 years)

128 Master students

108 PhD students

66 post-docs

Ongoing collaboration and student exchange in Geophysics with Norway

University of Bergen

MoU for student and faculty exchange;
2 faculty
2 students



SIU-CAPES collaboration

2 summer schools, 2 joint field excursions

Trondheim

MoU for student and faculty exchange
4 students



NTNU
Norwegian University of
Science and Technology

Department of Petroleum Engineering and Applied Geophysics



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Ongoing oil and gas relevant research at IAG-USP

Research Center on Geodynamics of Sedimentary Basins and implications for exploration potential – **GEO-SEDEX**

Thematic Project Fapesp 2013/24215-6: **Pantanal, Chaco and Parana basins (PCPB): evolution and seismic structure of the crust and upper mantle**

Petrobras Geodynamics Network Project: **BRASIS: The Brazilian Seismological Network**

Thematic Project Fapesp 2016/06114-6: **The Neoproterozoic Earth System and the origin of life complexity**

Petrobras Geodynamics Network Project: **Paleogeography and magnetic stratigraphy of Brazilian sedimentary basins**

Regular Project Fapesp 2013/21084-8: **Interactions between mantle dynamics and shallow processes in continental margins**

Petrobras Numerical Modelling Network Project: **Thermochronological study and numerical modeling of surface and tectonic processes along divergent margins**



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Ongoing oil and gas relevant research at IAG-USP

Research Center on Geodynamics of Sedimentary Basins and implications for exploration potential – **GEO-SEDeX**

Thematic Project Fapesp 2013/24215-6: **Pantanal, Chaco and Parana basins (PCPB): evolution and seis**
Petrobras Geodynamics Netw
Network

Deep Earth structure
Seismic monitoring (earthquake hazards)

Thematic Project Fapesp 2016/06114-6: **The Neoproterozoic Earth System and the origin of life comple**
Petrobras Geodynamics I
stratigraphy of Brazilian

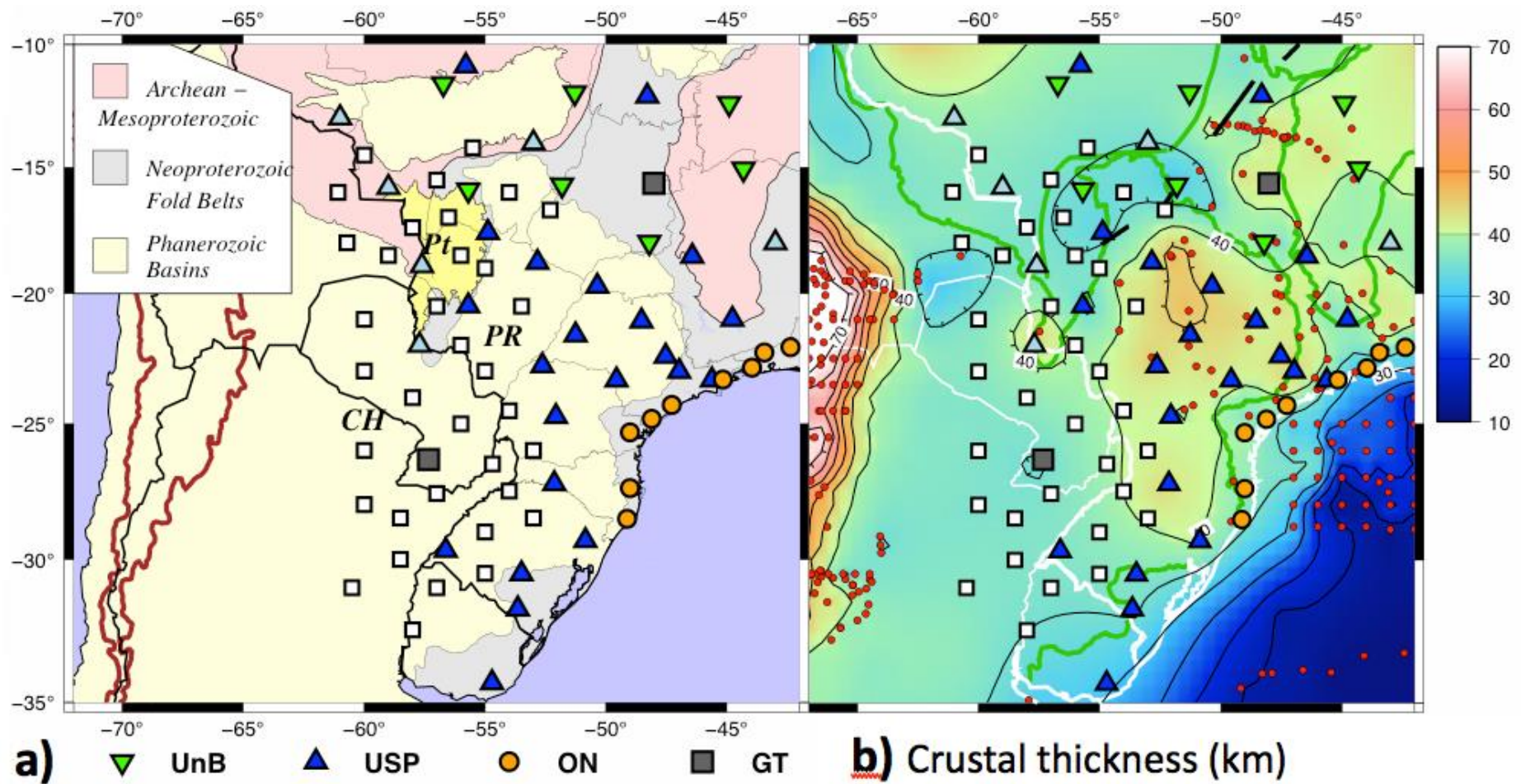
Earth's Paleogeography
Ancient Neoproterozoic continental margins

Regular Project Fapesp 2013/21084-8: **Interactions between mantle dynamics and shallow processes in continental margins**

Petrobras Numerical
numerical modeling
margins

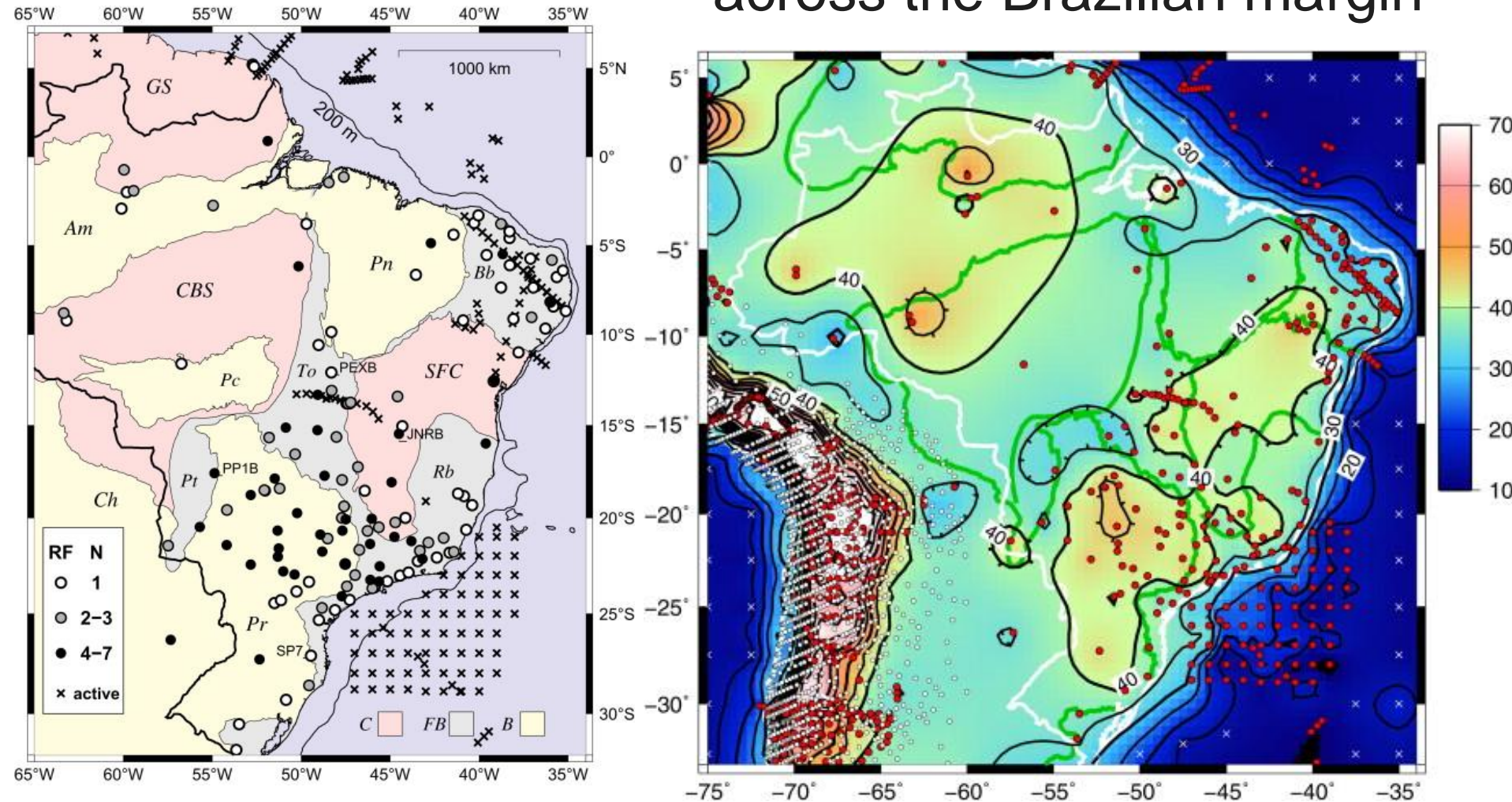
Geodynamics of continental margins
Interaction between deep and shallow processes

Brazilian Seismological Network (RSBR)

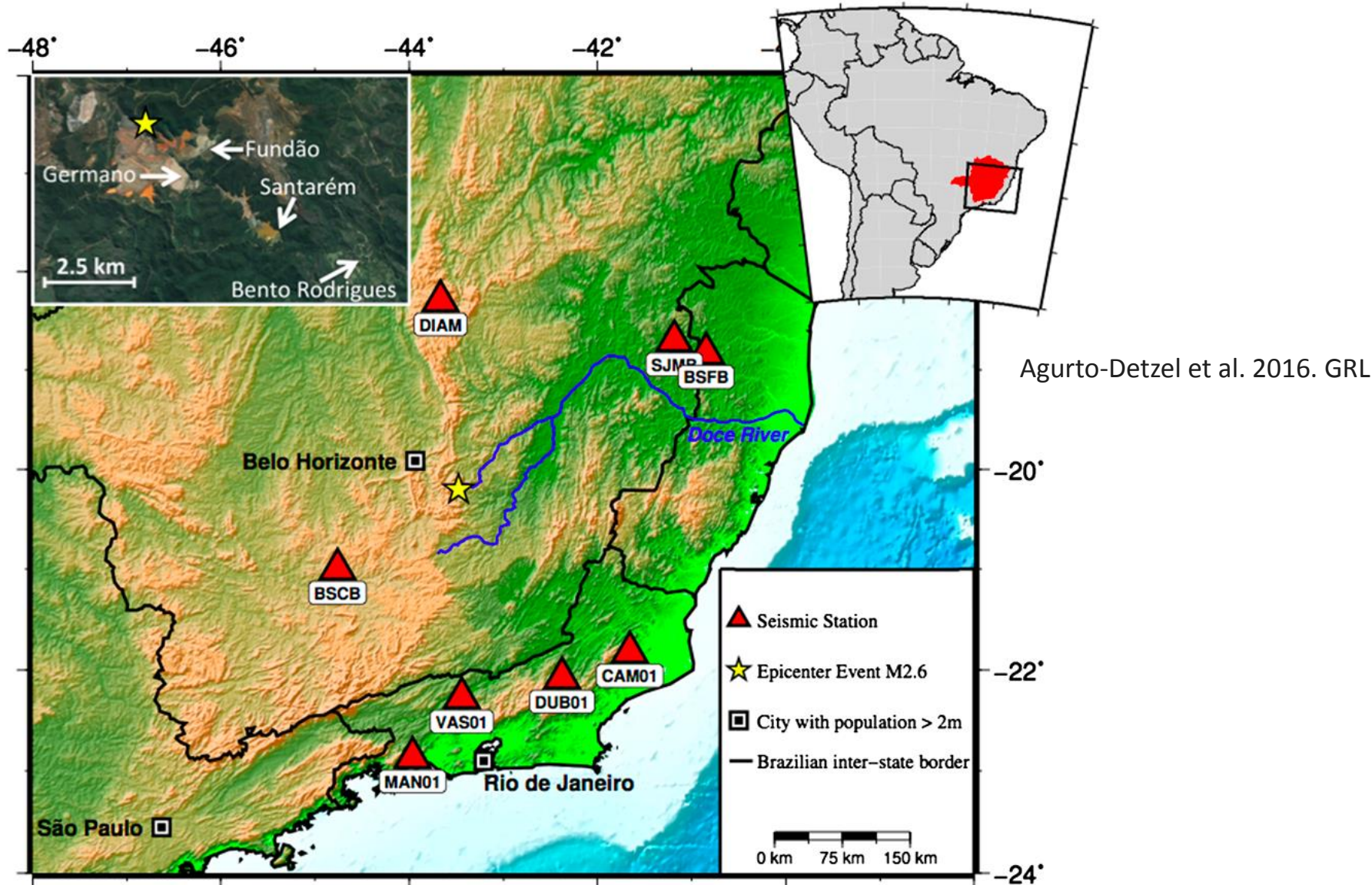


Thematic Project Fapesp 2013/24215-6: **As bacias do Pantanal, Chaco e Paraná (PCPB): evolução e estrutura sísmica da crosta e manto superior"**

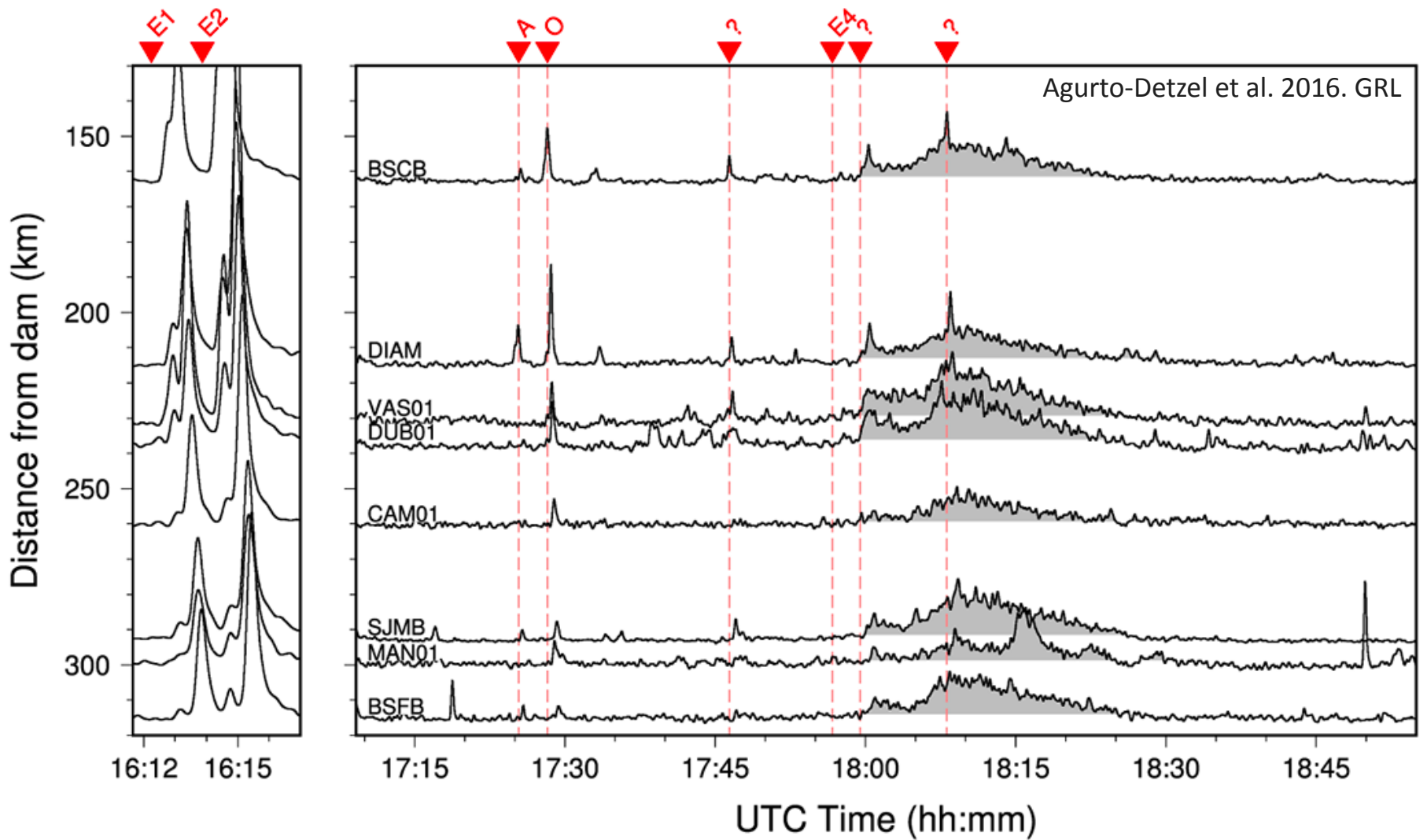
Changes in crustal thickness across the Brazilian margin



Thematic Project Fapesp 2013/24215-6: As bacias do Pantanal, Chaco e Paraná (PCPB): evolução e estrutura sísmica da crosta e manto superior"

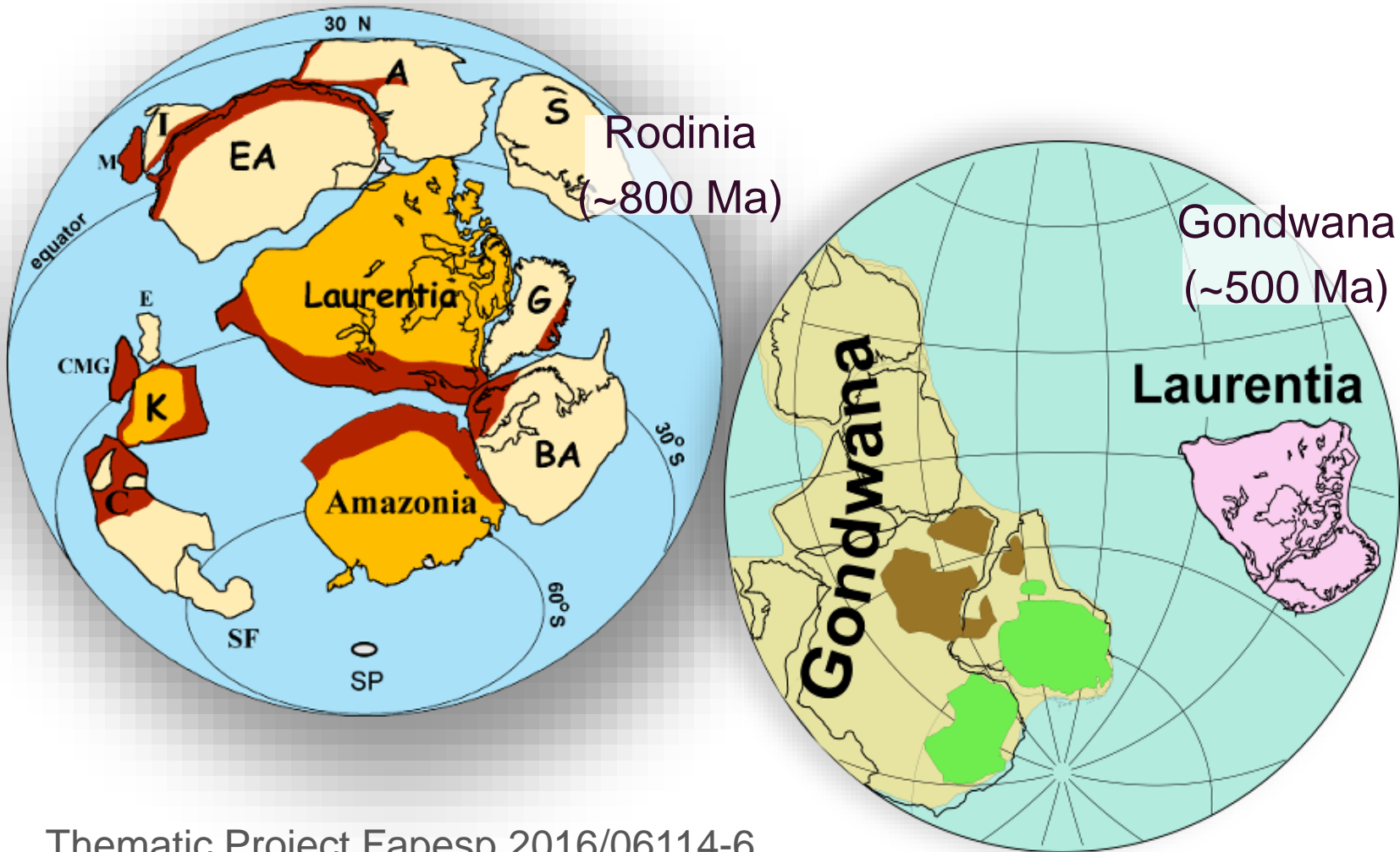


The tailings dam failure of 5 November 2015 in SE Brazil and its preceding seismic sequence

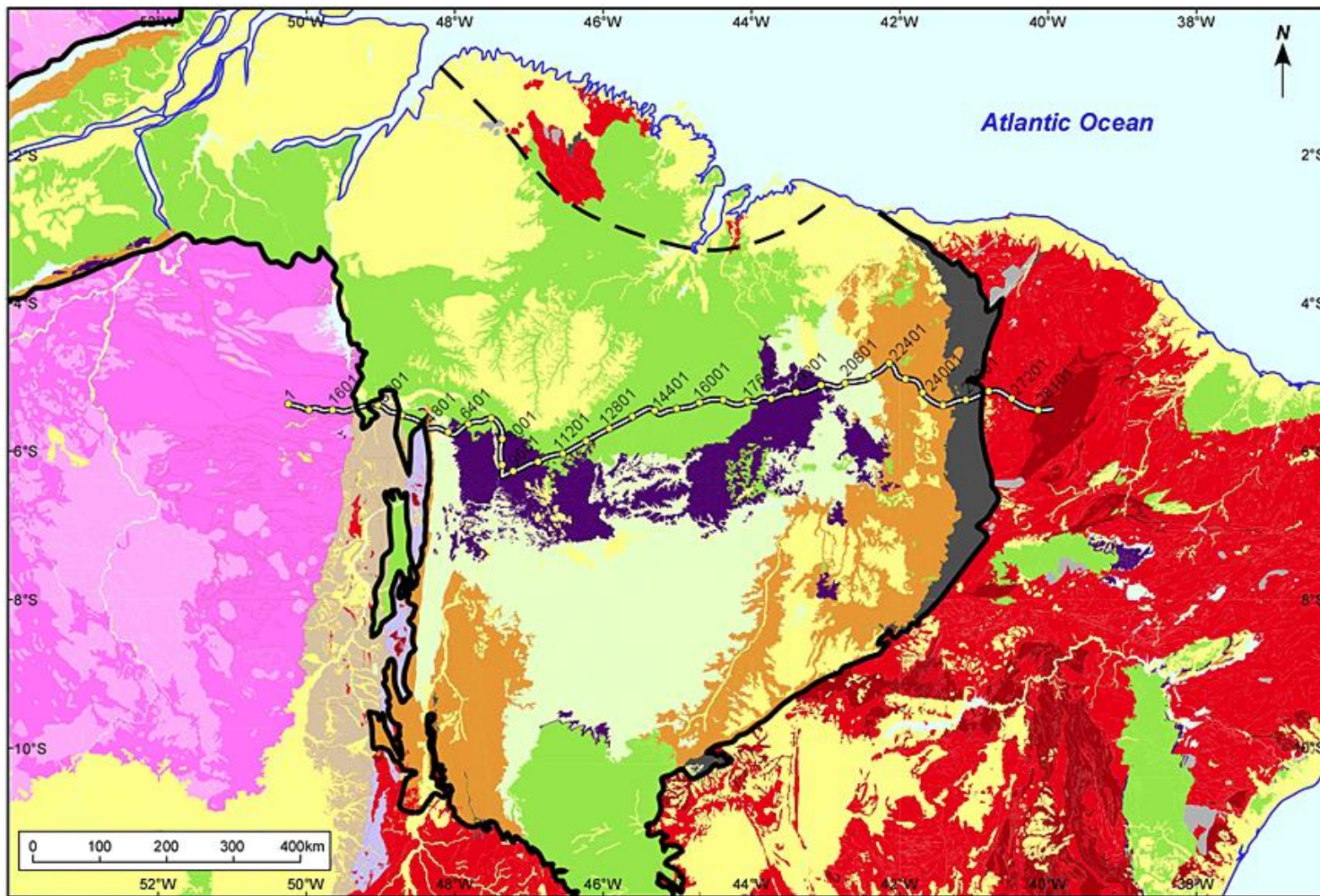


The tailings dam failure of 5 November 2015 in SE Brazil and its preceding seismic sequence

Basin's substratum was a passive margin once: Neoproterozoic oceanic margins and inheritance



Thematic Project Fapesp 2016/06114-6
**O Sistema Terra no Neoproterozóico e a
evolução da vida complexa**



Legend

- Seismic Trace number
- Regional Line
- Basin outline
- - Southerly limit of São Luís craton

Phanerozoic

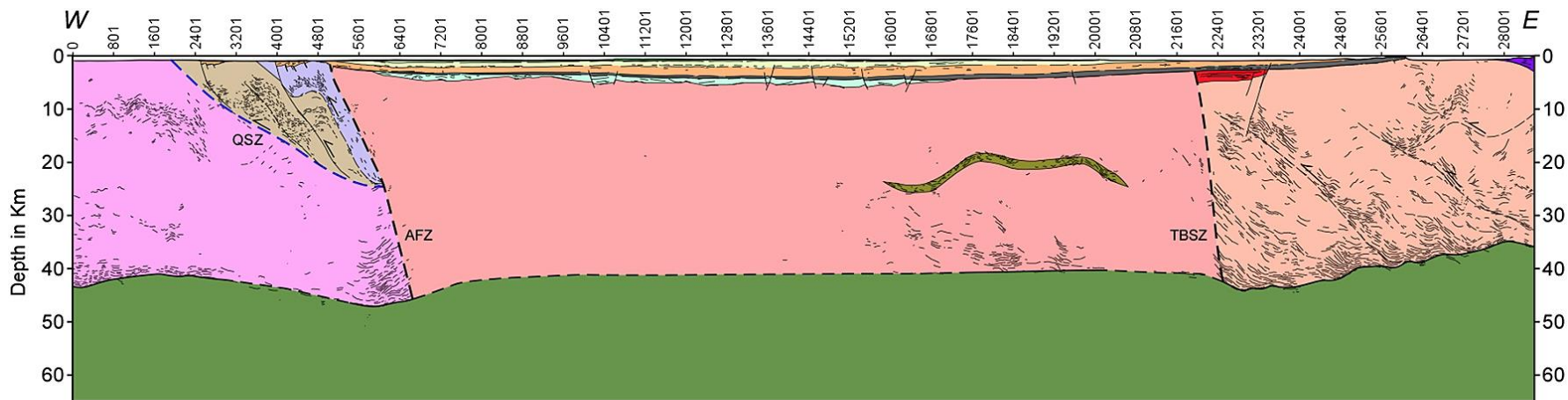
- Cenozoic
- Cretaceous (MS-5)
- Jurassic (MS-4)
- Pennsylvanian-Triassic (MS-3)
- Devonian-Mississippian (MS-2)
- Silurian (MS-1)
- Cambrian (MS-0)

Neoproterozoic

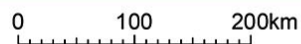
- Estrondo Group
- Tocantins Group
- Undifferentiated

Paleoproterozoic and Archaean

- Paleoproterozoic - Amazonian craton
- Archaean - Amazonian craton
- Undifferentiated Borborema Province, São Luís\Gurupi Belt and São Francisco cratons



Daly et al., 2015. JGR



- Extensional fault
- Thrust fault
- Quatipuru suture zone (QSZ)
- Block boundary
- Moho - imaged
- Moho - extrapolated

AMAZONIAN / ARAGUAIA

- Mesozoic
 - Upper Paleozoic
 - Estrondo Group
 - Tocantins Group
 - Amazonian Craton
- } Araguaia Supergroup

AFZ

PARNAÍBA

- Mesozoic
- Upper Paleozoic
- Lower Paleozoic
- Late Neoproterozoic
- Mid-crustal reflectivity (MCR)
- Parnaiba block crust

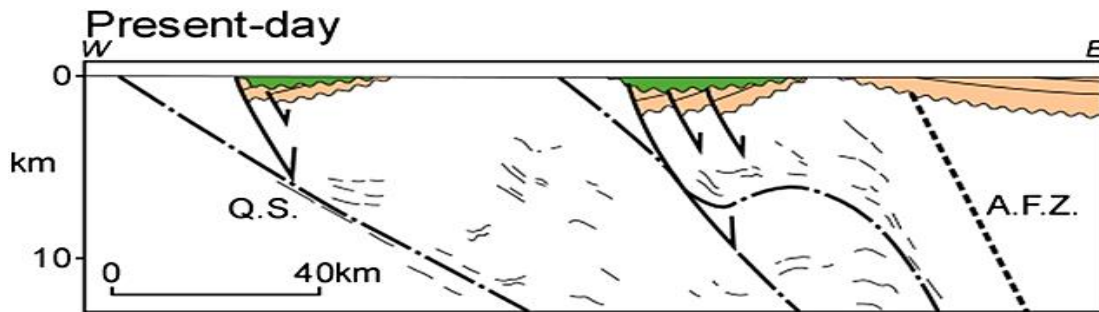
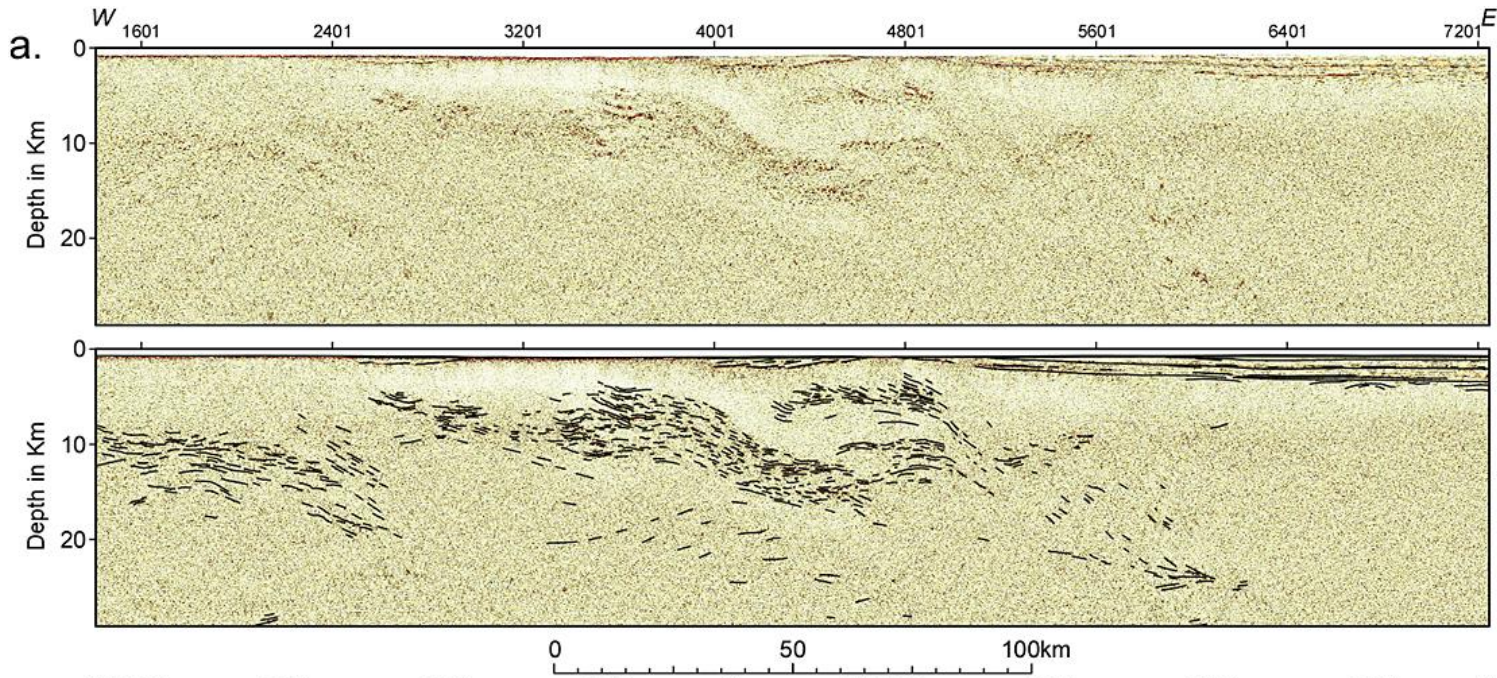
TBSZ

BORBOREMA

- Upper Paleozoic
 - Lower Paleozoic
 - Jaibaras Trough equivalent
 - Cruzeta complex
 - Ceará central domain
- } Borborema Province

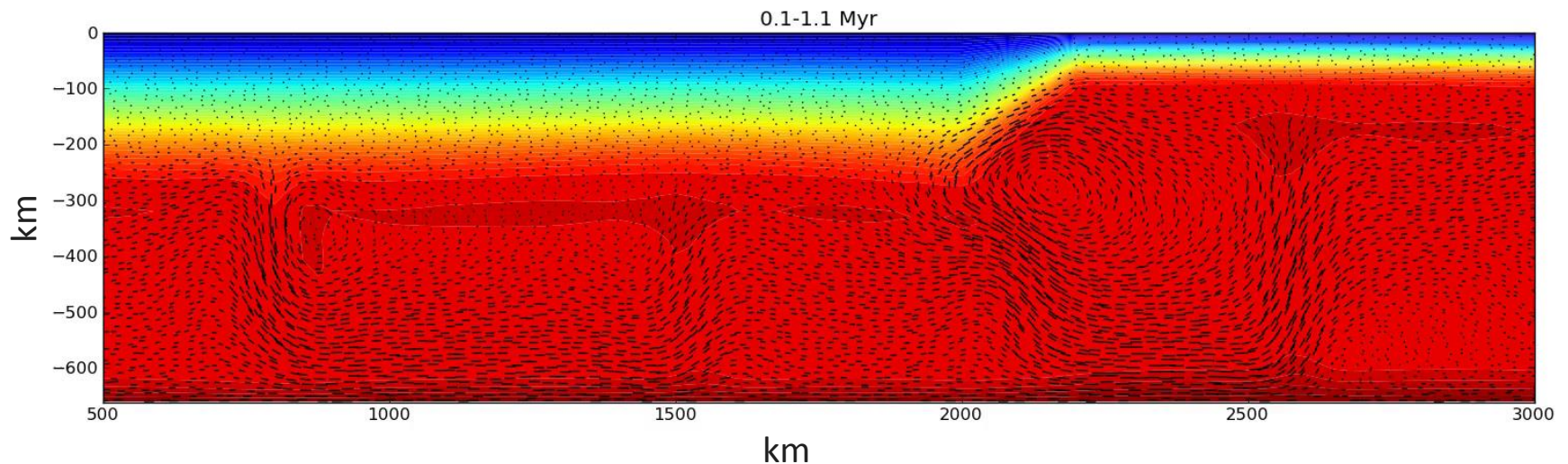
Mantle

Seismic expression of the geological suture



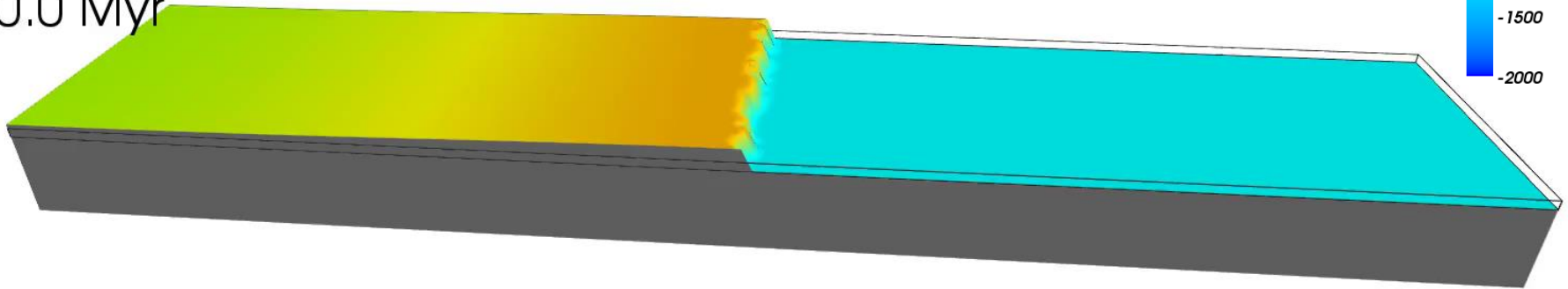
Post-rift influence of small-scale convection on the landscape evolution at divergent continental margins

Mantle convection at divergent continental margins
(thermochemical convection model)

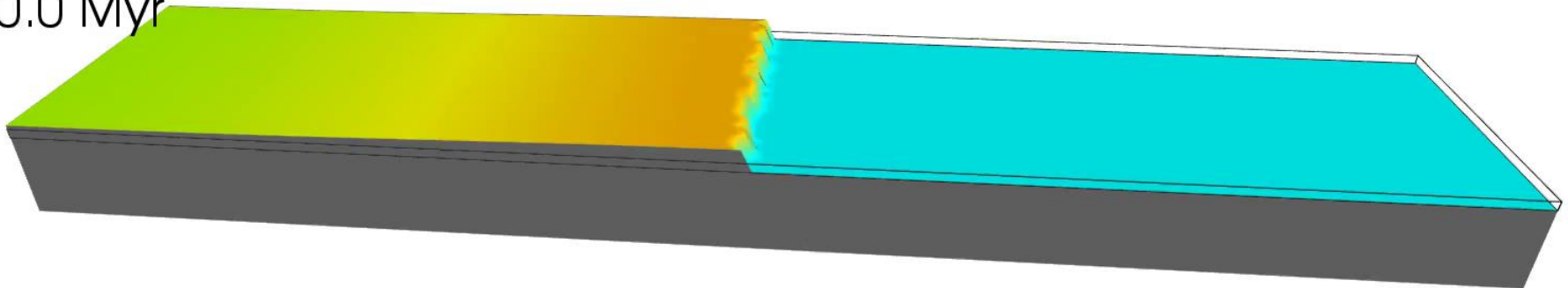


Post-rift influence of small-scale convection on the landscape evolution at divergent continental margins

Surface processes + Flexure + Mantle convection
0.0 Myr



Surface processes + Flexure
0.0 Myr



Main topics for future collaboration in Geophysics with Norwegian institutions

- ✓ Deep structure of modern and ancient margins
- ✓ Onshore-offshore links (deep refraction profiles)
- ✓ Numerical modeling of geodynamic processes