

Minute of the First Business Meeting of IGCP 648
AGU-GACMAC Joint Assembly, Montreal, 5 May 2015
by Sergei Pisarevsky, Project Secretary

Z.X. Li: PowerPoint presentation (see slides following the minute).

Discussions on proposed project products (see slide #14):

B. Murphy: Suggests to organize a special issue for Damian Nance (retirement soon?) – will follow this up.

Also suggests to organize informal events during international gatherings (e.g. football plays) – future field symposium organizers to organise as a social event?

Steven Johnston: Proposes to send annual reports of regional groups to the project secretary to help with IGCP 648 annual reports. *Z.X. Li:* agreed.

Discussions on project activities (see slide #15):

Z.X. Li: On the organization of annual symposiums/workshops: First symposium is suggested to be in December 2015 in Hawaii, few days before AGU Fall meeting. For this symposium both invited lectures and five-minute short talks should be presented. Full papers should be presented at a proposed AGU session on supercontinent cycles and global geodynamics (linked to IGCP 648). Field excursion to volcano is suggested.

D. Evans: Agreed and noted that Hawaii is convenient to people from Asia and Australia.

R. Ernst: Reminder: August 14-24, 2016: INTERNATIONAL DYKE CONFERENCE: IDC7.

Z.X. Li suggest to link the event to IOGCP 648, and will list the web link at the project site when provided.

Z.X. Li: Note the 2016 field symposium as a part of the GACMAC meeting at Whitehorse, Canada. Another major event in 2016 will be the 35th IGC 35 in S. Africa and there will be a couple of IGCP 648-related/sponsored session there. All events will be advertised at the IGCP 648 web site (<http://geodynamics.curtin.edu.au>)

Suggestions for future symposia or the Rodinia 2017/2018 meeting?

B. Murphy: Friends of Grenville & Rodinia 4 (suggested to talk to Toby Rivers).

Z.X. Li: Suggest Mt Isa to examine the possible counterpart of the NW Canadian geology in Nuna. Field excursion to be led by Gorge Gibson who organised such a trip before and has already agreed to lead such a trip again. Where to have the indoor meeting (Rodinia 4) and who to organise it?

Other suggestions:

D. Evans: Labrador, or Tasmania

B. Eglington: South Africa.

Action: Z.X. Li will follow up various Rodinia 4 ideas later in the coming year.

R. Ernst: Suggest to organize training sessions/workshops

Z.X. Li: Training sessions/workshops similar to what we had prior to the 2005 Fremantle symposium (Rodinia 1)

Discussions on project work structure (see slide #16):

Z.X. Li: Organization of **theme working parties** for: database, geodynamics, and mineral deposits; and formation of **national/regional working groups** – there have already been expression of interests for formation of a Chinese Working Group (Profs. Shihong Zhang and Xianhua Li), a Russian Working Group (Prof. Dmitry Gladkochub), and a Baltica or Nordic Working Group (Prof. Lauri Pesonen). The roles of such national/regional working groups include coordinating regional research (such as joint grant applications etc.), identify regional leaders to contribute to databases, and to organise events. More expresses of interests are welcome, and once such working groups are set up, we will list them at the project web site.

The purpose of theme working parties are to coordinate theme-specific research. For example, each database coordinator will form a small "executive" committee (say, of five people) to seek input and make decisions regarding database format etc.

S. Pisarevsky: Databases – proposed to send examples of possible searching queries.

C. Quesada asked to send more invitations for people to participate in the project. Li replied that a few large email lists have already been used. People can find the membership form at project web site <http://geodynamics.curtin.edu.au/members/>.

Someone suggested to set up an IGCP 648 Twitter account. Z.X. Li will look into it.



Supercontinent cycles and global geodynamics

— IGCP 648

(2015–2020)

<http://geodynamics.curtin.edu.au/>

By Z.X. Li

Main challenge to plate tectonic theory:

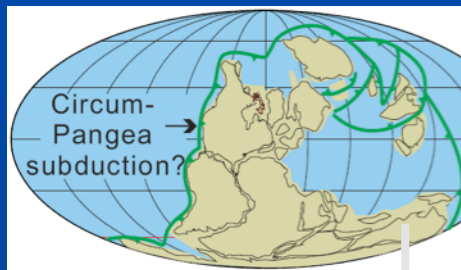
Driving mechanisms

New advances

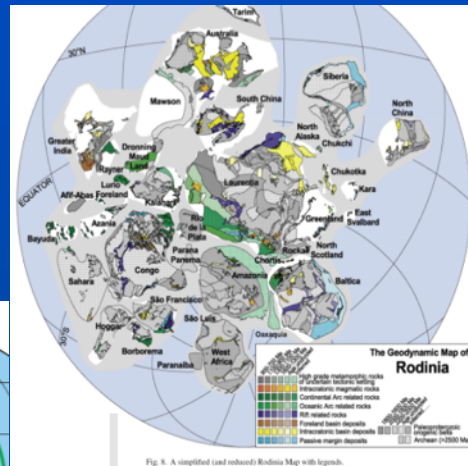
An Earthscience renaissance since the 80s?

1. Supercontinent cycles

Supercontinent cycles since at least the Proterozoic



Pangea
(320-170 Ma)



Rodinia
(900-700 Ma)



Nuna / Columbia
1800-1300(?) Ma

*Earlier supercontinents or
Supercratons? (i.e. W. Bleeker)*

Kenorland



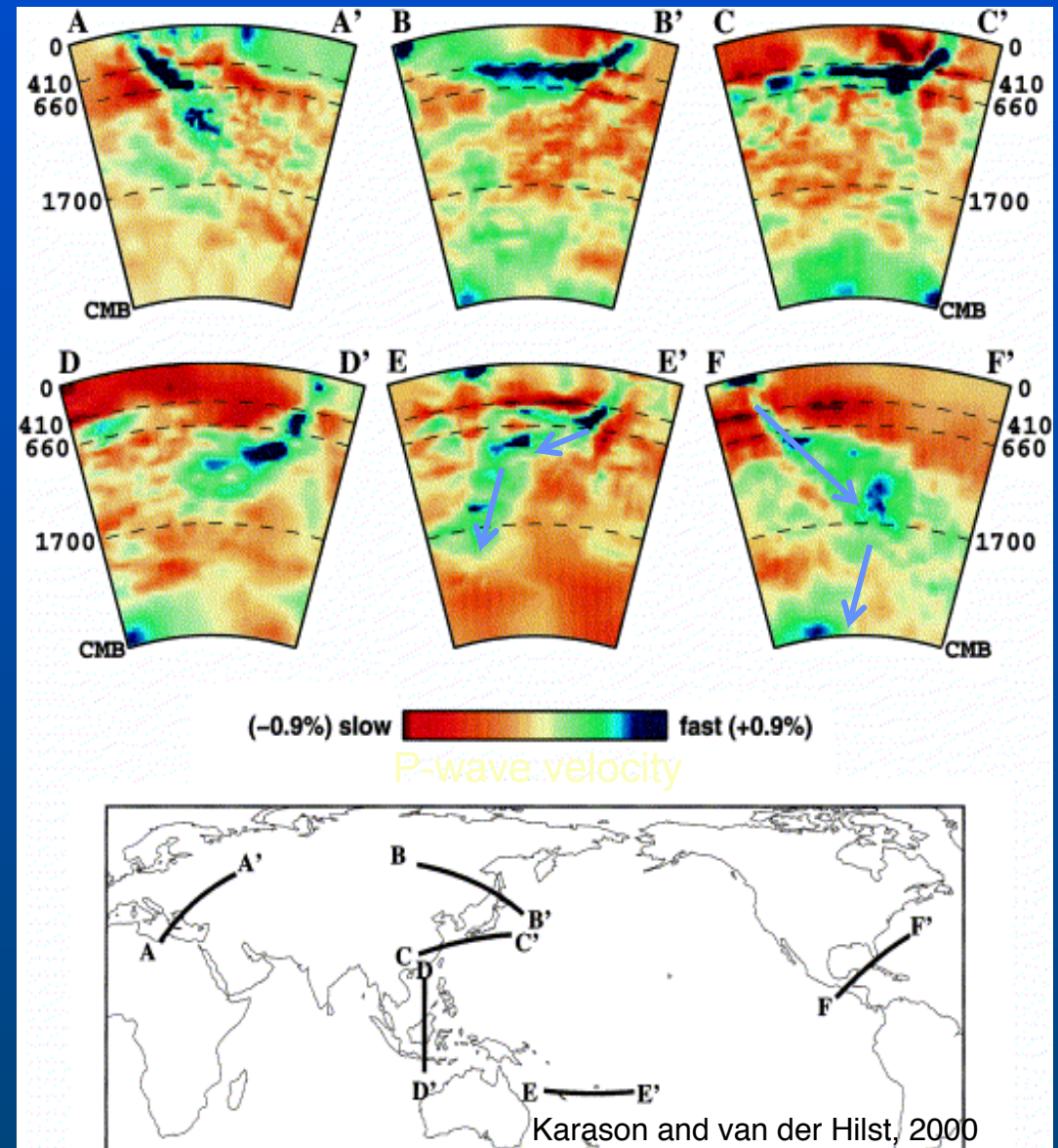
2. Mantle observations:

Key recent findings:

1. Slab subduction:

- Stagnation at mantle transitional zone (410-660 km depth), and
- Down to core-mantle boundary (CMB) - “slab graveyard”

→ *Evidence for whole-mantle convection*



2. Mantle observations:

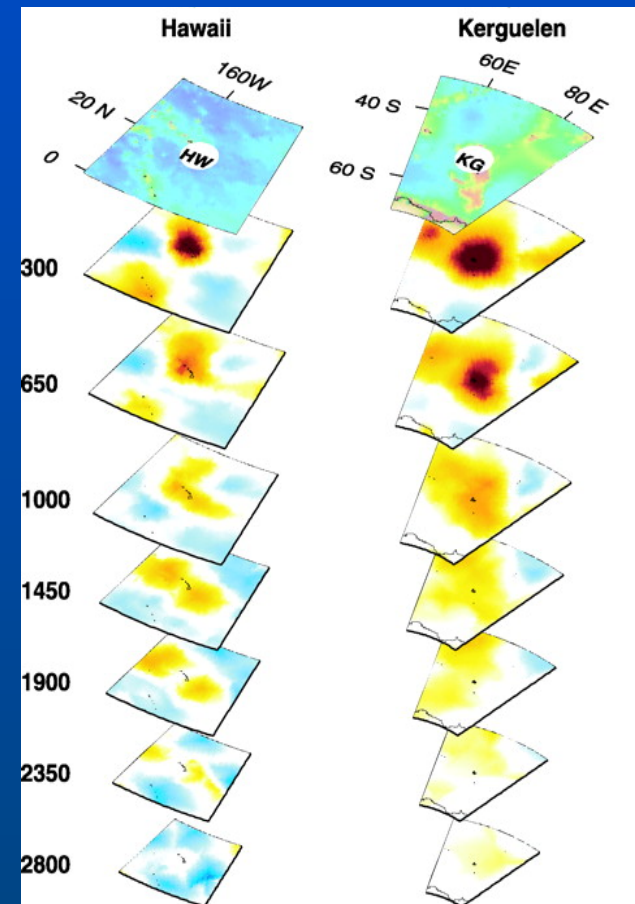
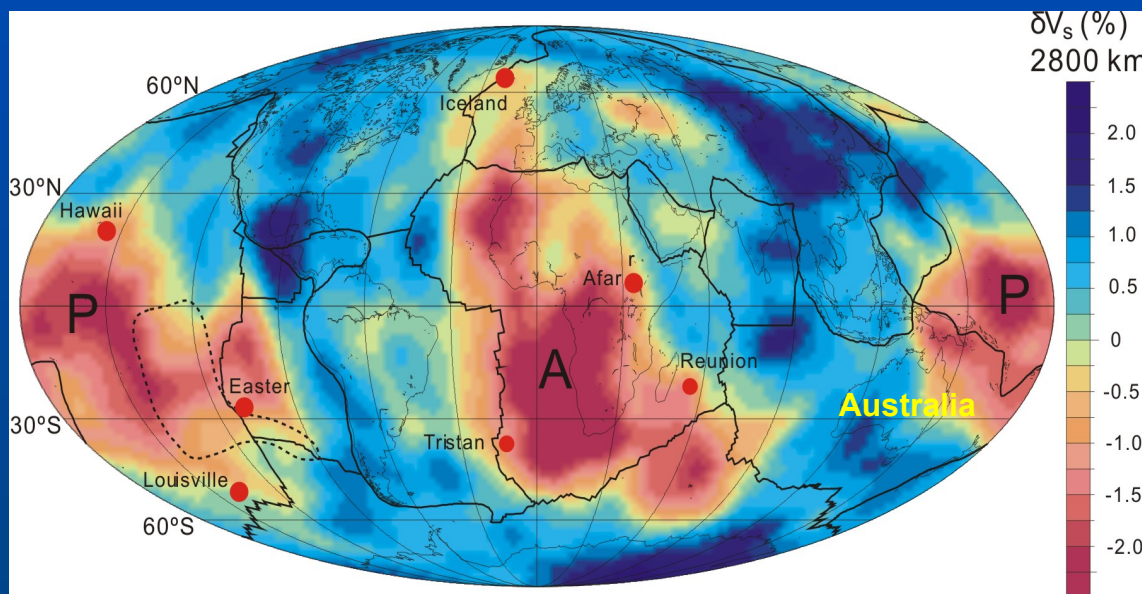
Key recent findings:

2. Mantle plume and superplume:

- Two broad (thousands km in dimension) low-velocity regions in the lower mantle – “superplumes”



Mantle return flows? Evidence for whole-mantle convection?



(R Montelli et al., Science 2004)

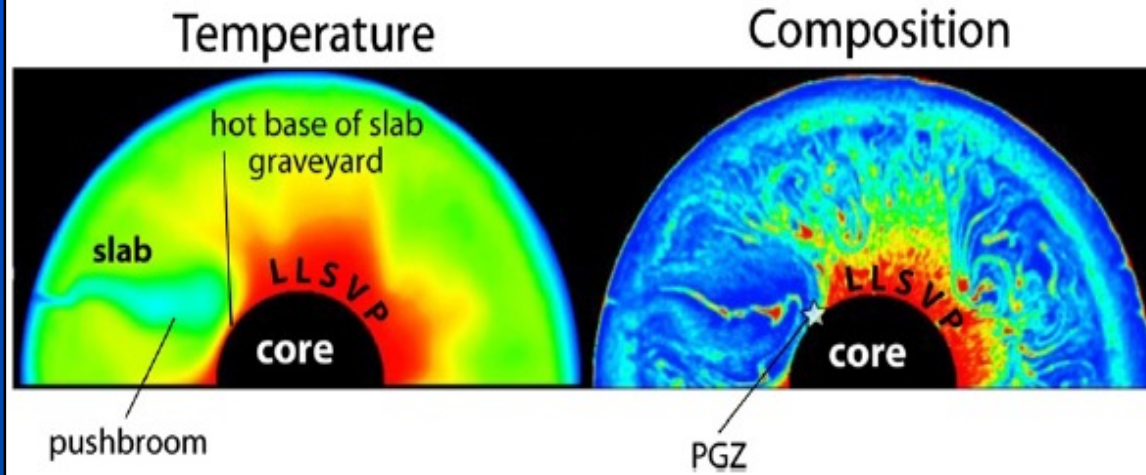
Shear wave velocity anomalies near core-mantle boundary (CMB)

A = African superplume/superswell; P = Pacific superplume/superswell.

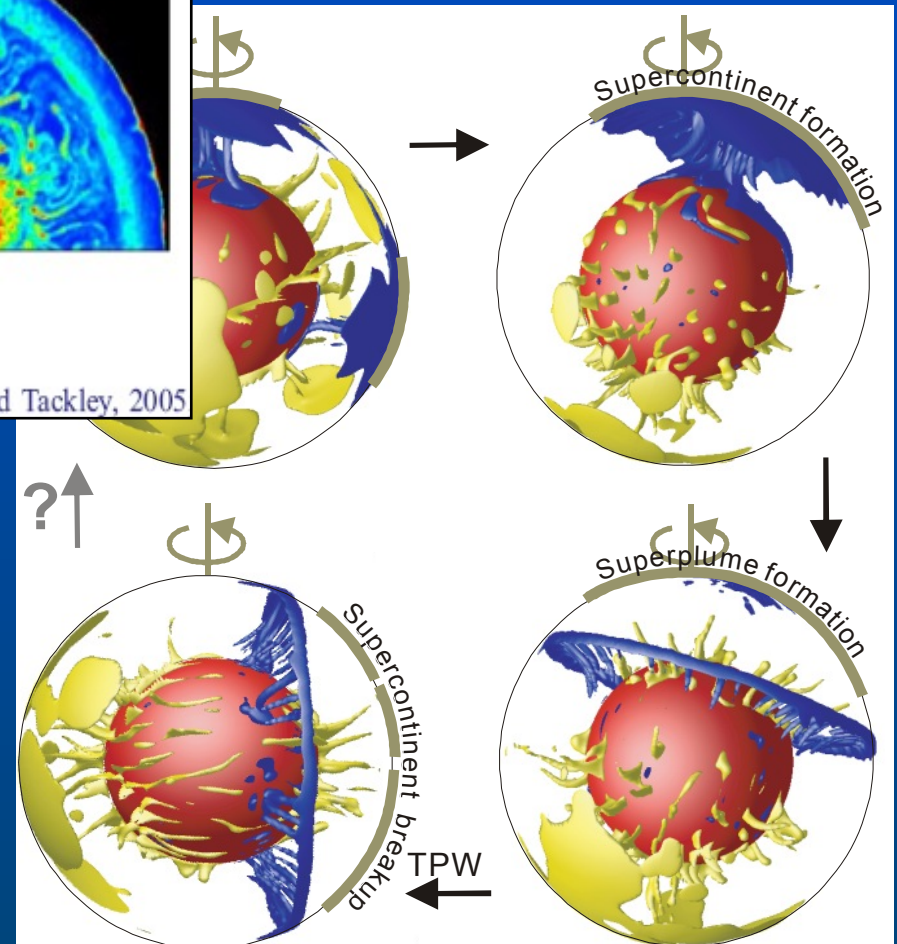
After Becker and Boschi (2002) and Burke and Torsvik (2004)

3. Geodynamic modeling capacity

K. Burke et al. / Earth and Planetary Science Letters 265 (2008) 49–60



in at the CMB — cross section showing mantle structure (based on Nakagawa and Tackley, 2005)



Zhong et al., 2007



Project Co-Leaders:

Professor Zheng-Xiang Li
Curtin University

Professor David Evans
Yale University

Professor Shijie Zhong
University of Colorado Boulder

Professor Bruce Eglington
University of Saskatchewan

Project Secretary:

Dr. Sergei Pisarevsky
Curtin University

<http://geodynamics.curtin.edu.au/>

Supercontinent Cycles and Global Geodynamics

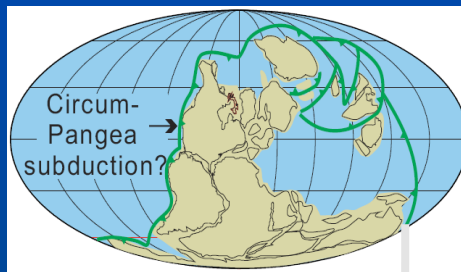
— *IGCP 648*

Build on the knowledge, expertise and lessons from:

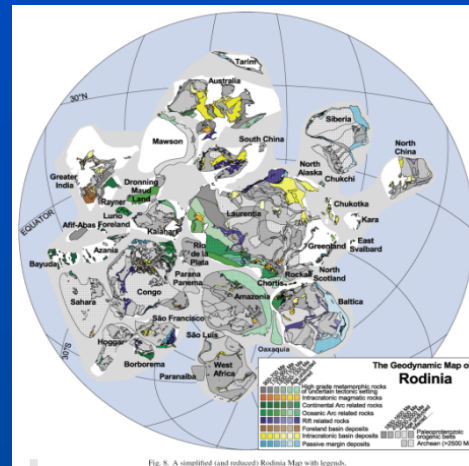
- IGCP 440 (1999-2004): Assembly and Breakup of Rodinia
- IGCP 509 (2005-2009): Paleoproterozoic Supercontinents and Global Evolution
- IGCP 597 (2011-2015): Amalgamation and Breakup of Pangaea
- IGCP 628 (2013-2017) – The Gondwana Map Project

Scopes — 1:

Supercontinent evolution since at least the Proterozoic: timing, configuration, and mechanism – *are they cyclic?*



Pangea
(320-170 Ma)



Rodinia
(900-700 Ma)



Nuna / Columbia
1800/1600 - 1300(?) Ma

*Earlier supercontinents or
Supercratons? (i.e. W. Bleeker)*

Kenorland



Scopes — 2:

Data-rich reconstructions for more robust analyses:
user- and Gplate-friendly **database construction**

- geology (including LIPs),
- mineral deposits, and
- Paleomagnetism
- ...

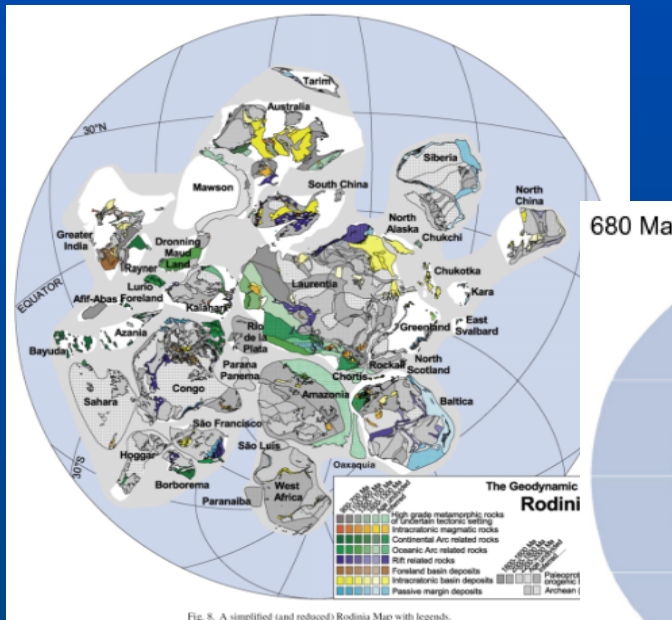
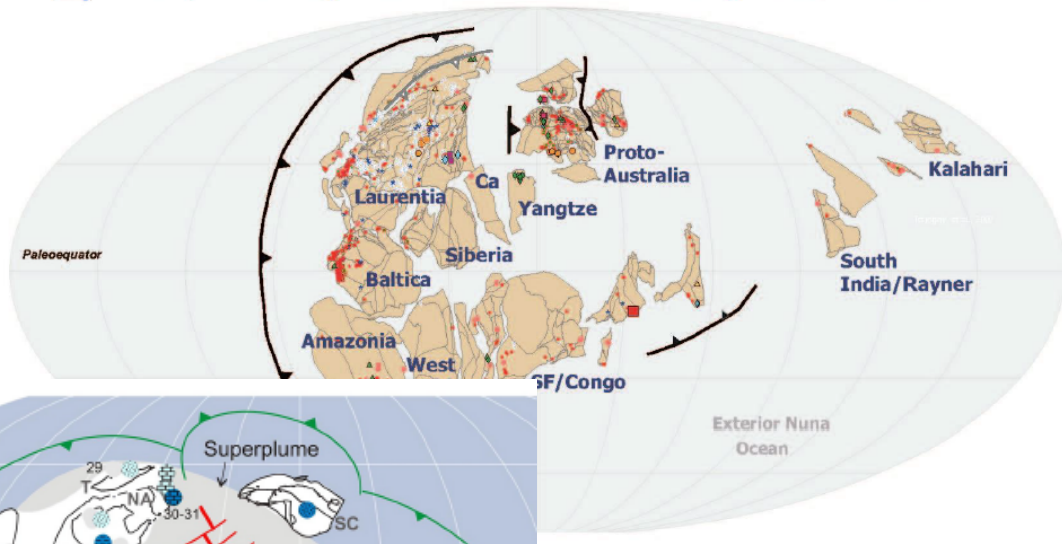
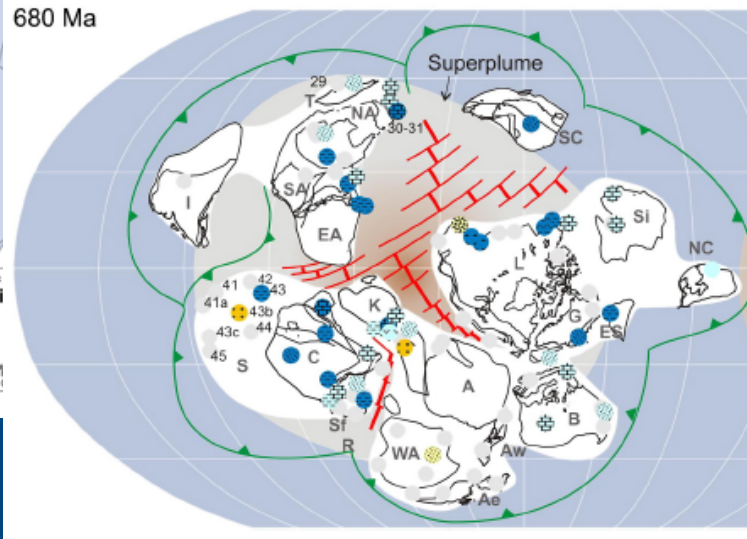


Fig. 8. A simplified (and reduced) Rodinia Map with legends.

B) Peripheral orogenesis and interior reworking: 1.78 - 1.60 Ga



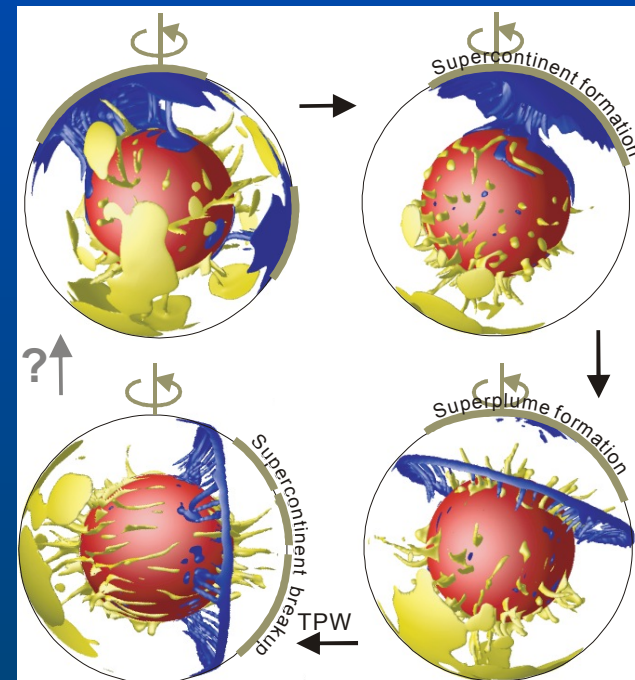
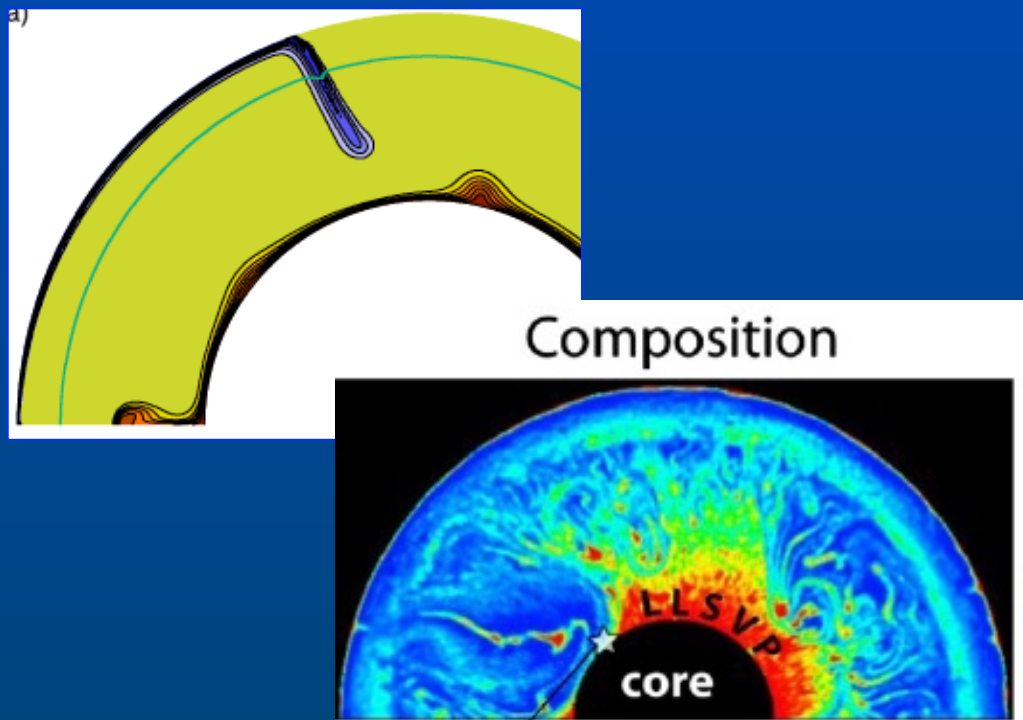
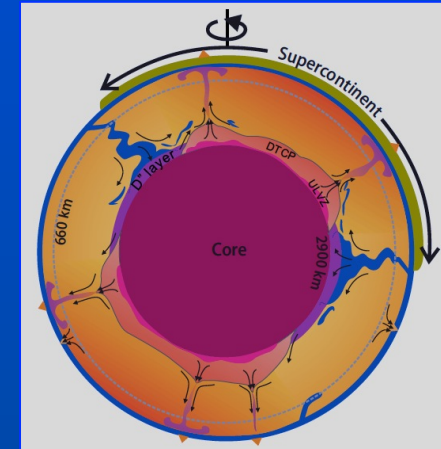
680 Ma



Scopes — 3:

Data-constrained global geodynamic modelling – how the Earth works:

- supercontinent-superplume coupling?
- geodynamic driving forces?
- ...



Items for discussion

1. Possible products:

- A continuous global paleogeographic animation from 2 Ga
- User- and Gplate-friendly geological/LIPs, mineral and paleomagnetic databases free for all
- Journal special issues/books
- A new understanding of how Earth evolved and how it works

Please acknowledge
“This is a contribution to IGCP 648”
at the end of your papers!

2. Activities:

- Annual field workshop/symposium
 1. 2015 December 10-12, Hawaii
 2. 2015 December 14-18 AGU Fall Meeting, special session proposed, San Francisco
 3. 2016 June 1-3 GACMAC meeting special session and field trip, Whitehorse, Canada
 4. 2016 June 26-30 Australian Earth Sciences Convention special session, Adelaide, Australia
 5. 2016 Aug. 27-Sept. 4 35th IGC special sessions, Cape Town, Africa
 6. Rodinia 2017/2018??? (2013 was in Moscow)
- A lot of cross-discipline and cross-nation collaborations
.....

3. Work structure

- Special *working parties* for:
 - Database construction (Coordinator/Leader Bruce Eglington plus Sergei Pisarevsky – palaeomagnetism Richard Ernst – LIPs Sally Pehrsson – mineral deposits)
 - Reconstruction (?)
 - Geodynamic modelling (Coordinator/Leader Shijie Zhong)
 - Mineral deposits (Coordinator/Leader Sally Pehrsson)
- *(National) working groups* for large nations/regions

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Welcome to join NOW!

<http://geodynamics.curtin.edu.au/>