The petrological control on the lithosphere-asthenosphere boundary (LAB) beneath ocean basins

Yaoling Niu. Durham University, Durham, United Kingdom; Institute of Oceanology, Chinese Academy of Sciences, Qingdao 266071, China and David H Green, University of Tasmania, Hobart, TAS, Australia

Abstract Text:

The oceanic lithosphere thickens with age by accreting asthenosphere material from below, and reaches its full thickness \( L \) of \( \sim 90 \) km at the age \( t \) of \( \sim 70 \) Ma. This lithospheric thickening fits the relation \( L \propto t^{1/2} \), consistent with conductive cooling to the seafloor. A puzzling observation is that although conductive cooling continues, the oceanic lithosphere ceases to grow any thicker than \( \sim 90 \) km when \( t > 70 \) Ma. Small scale convection close beneath the lithosphere-asthenosphere boundary (LAB) has been generally invoked to explain this puzzle. Using the compositional systematics of global ocean island basalts and results of experimental petrology, we affirm that the LAB is a petrological boundary marking the intersection of the geotherm with the solidus of an amphibole (pargasite)-bearing Iherzolite. The oceanic LAB is an isotherm of \( \sim 1100^\circ\mathrm{C} \) with \( L \propto t^{1/2} \) for \( t < 70 \) Ma, and an isobar of \( \sim 3 \) GPa (\( \sim 90 \) km) for \( t > 70 \) Ma. Small scale convection may take place, but it is not required to maintain the globally constant lithosphere thickness of \( \sim 90 \) km for \( t > 70 \).

Session Selection:
Geological Reactive Systems from the Mantle to the Abyssal Sub-seafloor

Submitter's E-mail Address:
yao1ing.niu@foxmail.com

Abstract Title:
The petrological control on the lithosphere-asthenosphere boundary (LAB) beneath ocean basins

Requested Presentation Type:
Assigned by Program Committee (oral, panel, poster, or lightning poster talk)

Previously Published?:
No

AGU On-Demand:
Yes

Abstract Payment:
Paid (agu-fm17-274354-1993-7684-8460-2632)

For non-students only: I would like to volunteer as an OSPA judge.

For non-students only: I am willing to help find OSPA judges for students in my session.

For non-students only: I am interested in receiving information on a mentoring program.

First Presenting Author

Presenting Author

Yaoling Niu

Primary Email: yaoling.niu@foxmail.com
Affiliation(s):

Institute of Oceanology, Chinese Academy of Sciences
Qingdao 266071 (China)

Durham University
Durham DH1 3LE (United Kingdom)

Second Author

David H Green

Primary Email: david.h.green@utas.edu.au

Affiliation(s):

University of Tasmania
Hobart TAS (Australia)

FINAL STEPS

1. Check spelling and contact information.
2. Make necessary corrections:
   • Select the step in the Abstract Control Panel that you wish to edit (e.g., Authors, Abstract Details)
   • Edit the information and click the submit button.
3. Click [HERE] to print this page now.