Dr Alistair Boyce

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Career Summary

2018 - 2021 **Research Associate, University of Cambridge.** PI: Dr Sanne Cottaar
Investigating the impact of multiple upwellings on the mantle transition zone beneath the African continent; insights from converted seismic phases.

2014 - 2018 **NERC PhD Studentship, Imperial College London.** Supervisor: Dr Ian Bastow
The Proterozoic building of North America: Insights from broadband seismic tomography.

Janet Watson Citizenship Prize: Awarded for services to Earth Science Department
William Edwards Educational Charity (£1500)
Imperial College-MIT Global Fellows Program (£600**)**

2010 - 2014 **MSci Geophysics, Imperial College London and The University of California, Berkeley**
Result: First Class Honours, Faculty of Engineering Dean's list & Governors' MSci Prize

Research Experience

Ongoing Projects Summary:

• Incorporating ~87,000 new measurements of absolute arrival-times from all temporary passive seismic networks in Africa (1990 to present-day) into a continental P-wave seismic tomographic model to reveal new evidence for multiple mantle upwellings beneath East Africa and modification of the Tanzanian craton during the Pan-African orogeny **(Boyce, A. et al.**, *in revision G-cubed*).

• Probing the thermochemical nature of mantle upwellings beneath Africa by mapping mantle transition zone topography using converted seismic phases to explore the deep mantle contribution to Cenozoic magmatism across the African plate and reconcile debate between the existing seismological and geochemical literature **(Boyce, A. et al.***, in review G-cubed*.).

• *Combining temporary seismograph network data across Canada and Alaska into an absolute P-wave seismic tomographic model to better understand the lithospheric signature of Precambrian continental collisions, ongoing Canadian Cordilleran deformation and Alaskan formation since ~80Ma.
Collaborators: Liddell, M.V. Estève, C. Schaeffer, A.J. Audet, P. Darbyshire, F.A. Schutt, D. Burdick, S.

Principle Publications:

Boyce, A. Cottaar, S. (*submitted)* Insights into Deep Mantle Thermochemical Contributions to African Magmatism from Converted Seismic Phases (*under review at G-cubed).*

Boyce, A. Bastow, I.D. Cottaar, S. Kounoudis, R. Guilloud De Courbeville, J. Caunt, E. Desai, S. (*submitted*) AFRP20: New P-wavespeed Model for the African Mantle Reveals Two Whole-Mantle Plumes Below East Africa and Neoproterozoic Modification of the Tanzania Craton (*in revision: G-cubed).*

Boyce, A. Bastow, I.D. Golos, E.M. Rondenay, S. Burdick, S. Van der Hilst, R.D. (2019). Variable modification of continental lithosphere during the Proterozoic Grenville orogeny: Evidence from teleseismic P-wave tomography. *Earth Planet. Sci. Lett.* 525, 115736, doi: 10.1016/j.epsl.2019.115763.

Boyce, A. Bastow, I.D. Rondenay, S. Van der Hilst, R.D. (2017), From relative to absolute teleseismic travel-times: the Absolute Arrival-time Recovery Method (AARM), *Bull. Seis. Soc. Am., 107* (5), 2511–2520, doi:10.1785/0120170021.

Boyce, A. Bastow, I.D. Darbyshire, F.A. Ellwood, A.G. Gilligan, A. Levin, V. Menke, W. (2016), Subduction beneath Laurentia modified the eastern North American cratonic edge: Evidence from P wave and S wave tomography, *J. Geophys. Res., 121* (7), 5013–5030, doi:10.1002/2016JB012838.

Co-Author Publications:

Pugh, S. Jenkins, J. **Boyce, A.** Cottaar, S. (*submitted*) Global receiver function observations of the X-discontinuity reveal recycled basalt beneath hotspots (*in review: Earth Planet. Sci. Lett.).*

Gilligan, A., Bastow, I.D. **Boyce, A.** Petrescu, L. Liddell, M.V. Darbyshire, F.A. Hawthorne, D.A. Lane, V. Daly, D. Simpson, D. Heffler, D. (2016), Peering beneath the Canadian crust, *Astronomy & Geophysics, 57* (6), 6.24–6.27, doi:10.1093/astrogeo/atw221.

Gilligan, A., Bastow, I.D. Watson, E. Darbyshire, F.A. Levin, V. Menke, W. Lane, V. Hawthorn, D. **Boyce, A.** Liddell, M.V. Petrescu, L. (2016), Lithospheric deformation in the Canadian Appalachians: evidence from shear wave splitting, *Geophys. J. Int., 206* (2), 1273–1280, doi:10.1093/gji/ggw207.

Presentations:

Invited: **Bullard Labs, Cambridge** (Nov 2018)**. Oxford Seismology Group** (Prof K. Sigloch – Dec, 2017)
Oral: **International Union of Geodesy and Geophysics** (Jul 2019), **American Geophysical Union (AGU)** (Dec 2017), **Canadian Geophysical Union** Joint Assembly (May 2015), **BGA** Postgraduate Research in Progress **(PGRiP)** (2nd Prize - Aug 2017, Sept 2015).
Poster: **AGU** (Dec 2019, Dec 2018, Dec 2016, Dec 2015), UK-Study of Earth's Deep Interior (May, 2019) **PGRiP** (Sept 2016).

Seismological Tools:

• **Lead Developer:** Absolute arrival-time recovery method (AARM - Boyce et. al., 2017).
Available at: github.com/alistairboyce11/AARM
• **Developer:** Toolbox utilizing receiver functions in python (with PI Cottaar).
Available: Autumn 2020.

Previous Collaborations:

2015 - 2019 **Professor Robert D Van der Hilst**, MIT Seismology Group, USA.
2016 - 2017 **Professor Stéphane Rondenay**, University of Bergen, Norway.

Seismological Fieldwork:

2017 Imperial College seismic network (TROODOS) – Cyprus (Mar & Sept)
2015 Québec-Maine III seismic array (Jul - Aug)
2015 Imperial College Canadian Maritimes Network: Nova Scotia/New Brunswick (May & Sept)

Supervisory and Teaching Assistant Roles – Imperial College (IC) & Cambridge (CAM)

2020 ***PI***: advertised role, interviewed, employed, trained, mentored 3 summer research students (*CAM*) Students processed arrival-time datasets for *Canadian-Alaskan imaging project, undertook independent projects, led methodological and tectonic discussion groups, gave final presentations.
2016 - 2018 ***Co-supervisor***: 2 MSci research projects, 4 undergraduate summer students (*IC*).
2015 - 2018 ***Demonstrator***: Undergraduate & Msc geophysics fieldtrips Cyprus & Emlicheim, Germany (*IC*)
2014 - 2019 ***Demonstrator/Graduate marker***: undergraduate modules, fieldwork, vivas (*IC/CAM*)

Outreach and Other Activities

2019 - 2020 **Deep Earth Explorers exhibit, Sedgwick Museum, Cambridge** (*Opened Mar. 2020*)
Exhibition content developer: interactive movies to explain seismic wave travel through Earth.
2019 - 2020 **Weekly Geophysics Seminar, Bullard Labs, University of Cambridge** (*including online*)
Organiser: invited/hosted speakers include: Long, M. (Yale), Simons, F.J. (Princeton), Rondenay, S. (Univ. Bergen), Rost, S. (Univ Leeds).
2018 **Marlin Training Fieldwork First Aid.**
2013 - 2014 **Coder Dojo, Imperial College**: Volunteer mentor teaching coding to children.

Professional body Membership

2014 - 2020 American Geophysical Union – Early Career Member.
2015 - 2020 British Geophysical Association/Royal Astronomical Society – Early Career Fellow.