Dr Alistair Boyce

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Career Summary

2021 - **CNRS Postdoc, LGL-TPE, Université Claude Bernard, Lyon1** PI: Dr Thomas Bodin
Using Bayesian methods to investigate the impact of parameterisation on seismic tomography.

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:

• Investigating the absolute P-wavespeed and mantle transition zone discontinuity structure below the Turkana depression using the recently deployed TRAILS network. Early results suggest possible implications for development of East African rifting, flood basalt magmatism and the nature of upwelling mantle.
Collaborators: Kounoudis, R. Bastow, I.D. Cottaar, S. Ebinger, C.J. Ogden C.S.

• *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. Pugh, S. Estève, C. Schaeffer, A.J. Audet, P. Darbyshire, F.A. Schutt, D. Burdick, S.

• Understanding the impact of parameterisation choices (isotropic and anisotropic) on seismic tomography using Bayesian methods. Quantifying these trade-offs may improve strategies for continental imaging and inform more robust interpretations.
Collaborators: Bodin, T.

Principle Publications:

Boyce, A. Cottaar, S. (2021) Insights into Deep Mantle Thermochemical Contributions to African Magmatism from Converted Seismic Phases, Geochem. Geophys. Geosyst., doi.org/10.1029/2020GC009478.

Boyce, A. Bastow, I.D. Cottaar, S. Kounoudis, R. Guilloud De Courbeville, J. Caunt, E. Desai, S. (2021) AFRP20: New P-wavespeed Model for the African Mantle Reveals Two Whole-Mantle Plumes Below East Africa and Neoproterozoic Modification of the Tanzania Craton, Geochem. Geophys. Geosyst., doi.org/10.1029/2020GC009302.

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.org/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.org/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.org/10.1002/2016JB012838.

Co-Author Publications:

Pugh, S. Jenkins, J. **Boyce, A.** Cottaar, S. (2021) Global receiver function observations of the X-discontinuity reveal recycled basalt beneath hotspots, *Earth Planet. Sci. Lett.* 561, 116813. doi.org/10.1016/j.epsl.2021.116813.

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.org/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.org/10.1093/gji/ggw207.

Presentations:

Invited: **University of Leeds - Global Seismology** (Apr 2021 - *virtual*), **Laboratoire de Géologie de Lyon - Global Seismology** (Dec 2020 - *virtual*), **Bullard Labs, Cambridge** (Nov 2018)**. Oxford Seismology Group** (Prof K. Sigloch – Dec 2017).

Oral: **American Geophysical Union (AGU)** (Dec 2020 - *virtual,* Dec 2017), **International Union of Geodesy and Geophysics** (Jul 2019), **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:** Seismological Methods Utilizing Receiver Functions in Python3 (with PI Cottaar).
Available at: doi.org/10.5281/zenodo.4337258

• **Developer:** RJ_MCMC Transdimensional inversion of Surface wave dispersion curves with the reversible jump algorithm (with PI Bodin and D. Soergel).
Available at: github.com/alistairboyce11/RJ_MCMC

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), Lyon (LY)

2021 - 2022 ***Co-ordinator:*** Designed and taught interactive course in Scientific English for non-native speakers – undergraduate level (LY).
2020 ***Co-supervisor/group leader***: Co-supervised 2 PhD students and co-lead group meetings and activities during PI's maternity leave (CAM – includes: Pugh et al., 2021).
2020 ***PI***: advertised role, interviewed, employed, trained, mentored 3 summer research UG 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 - 2021 ***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 - 2021 American Geophysical Union – Early Career Member.
2015 - 2021 British Geophysical Association/Royal Astronomical Society – Early Career Fellow.
2021 - 2022 Seismological Society of America – Early Career Member.