Magmatism and Continental Breakup in the South Atlantic

*** Fully funded PhD (subject to final contract) ***

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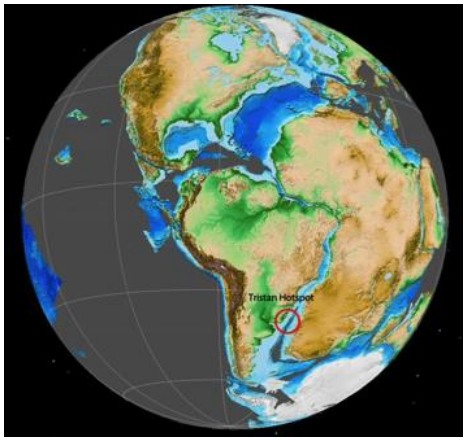

Importance of the area of research:
Continental breakup can generate huge volumes of magmatism, on scales never observed directly by mankind. In the geological record these events have been linked with significant climate change and mass extinctions. The magmatism is usually attributed to mantle plumes and several simple models exist to explain their behaviour. However, in the field the observations are often at odds with the model predictions. One notable example is offshore Brazil where along strike there is a change from magma-rich to magma-limited rifting, confusingly at a point where the onshore magmatism (the Parana Basin) appears to be most volumous. This asymmetry with respect to the proposed mantle plume head is quite unlike the pattern seen in the better-studied North Atlantic/Iceland plume case.

What you will do:
In this project we will go to sea in November 2025 aboard the German Research Ship R/V Merian. The student will join the international science party in Recife to collect the geophysical data needed to understand the complex geodynamic processes active when South America separated from Africa. We will collect wide-angle seismic data with instruments sourced from the UK, France and Germany positioned on the seabed to capture the along strike geological variations.

The student will work on a subset of the active-source seismic data. This will involve advanced travel-time and waveform tomography. These results will be combined with those from other team members working in parallel and be used to underpin numerical modelling work on the architecture of continental breakup under varying mantle conditions. The student will present their work at regular project meetings held in Europe and Brazil.

The project will advance our understanding of the how the Earth works as well have having direct impact on our understanding of resources on the poorly-known deep continental shelves.

Training:
The student will participate in all aspect of data collection, reduction and interpretation. They will develop team-working, project management and communication skills. Training will be given in seismic processing and interpretation. At Imperial the student will join the 'Geodynamics: Core to Surface' research group which holds regular meetings and workshops to develop skills.

We are seeking a numerate geoscience or physics graduate.
If you would like further information, please contact Jenny Collier (jenny.collier@imperial.ac.uk).

References:
Perez-Gussinye, M., J. S. Collier, J. J. Armitage, J. R. Hopper, Z. Sun and C. R. Ranero (2023). "Towards a process-based understanding of rifted continental margins." **Nature Reviews Earth & Environment** 4(3): 166-184 DOI: 10.1038/s43017-022-00380-y.

Taposeea, C. A., J. J. Armitage and **J. S. Collier** (2016). Asthenosphere and lithosphere structure controls on early onset oceanic crust production in the southern South Atlantic. Tectonophysics, doi: 10.1016/j.tecto.2016.06.026.