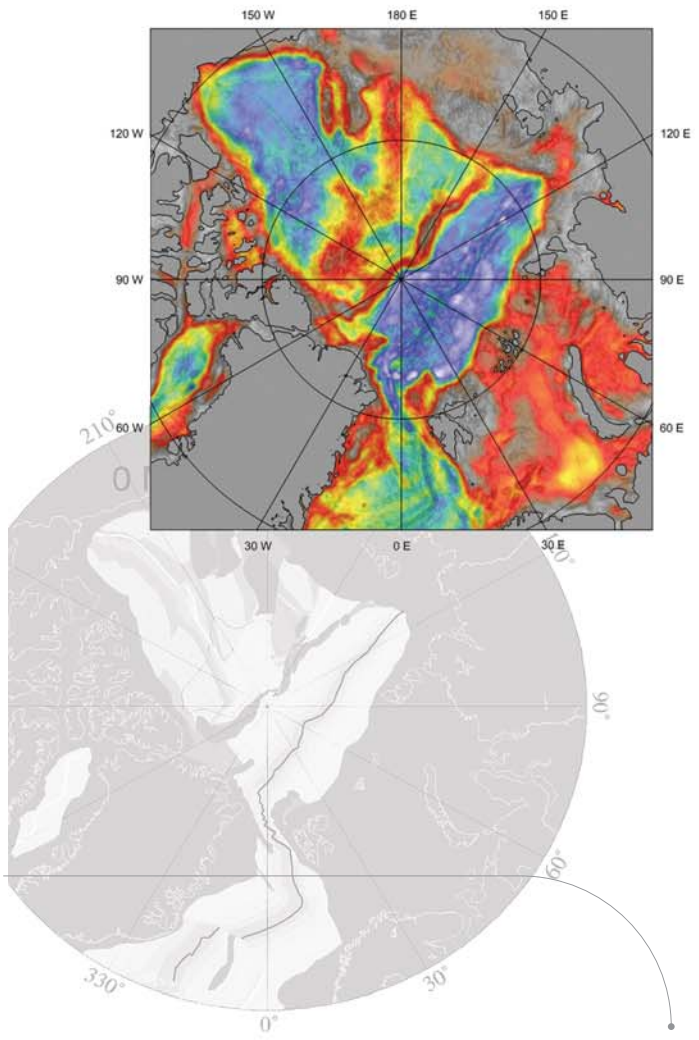

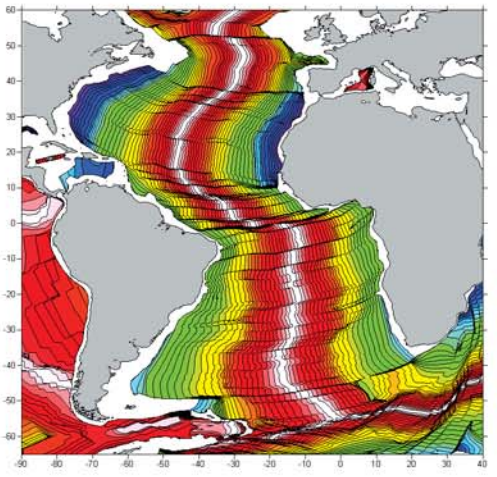

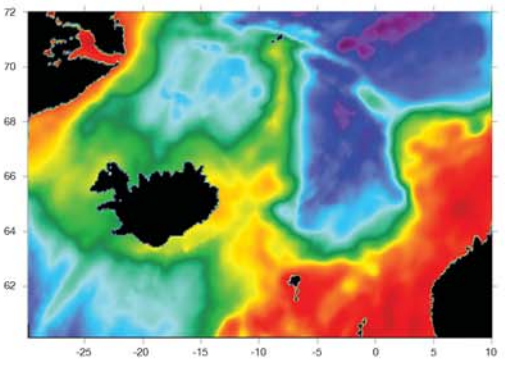

OCTek PROJECT

Assisting new ventures exploration strategy and petroleum systems analysis of deepwater rifted margins

Project Overview

The *OCTek project* (tectonics of the Ocean-Continent Transition) is a collaboration between Badley Geoscience and Prof. Nick Kusznir, leader of the Geodynamics Research Group at Liverpool University, UK. *OCTek* combines gravity inversion and plate reconstructions to support new ventures exploration at deepwater rifted continental margins together with associated petroleum systems modelling.

OCTek uses a new gravity inversion technique plus bathymetry and sediment thickness data to produce maps and grids of:

1 Depth to Moho
2 Total crustal thickness
3 Residual continental-crustal thickness
4 Crust and lithosphere thinning/beta factor
5 The residual thermal gravity anomaly at the present-day

at global rifted continental margins and their ocean-continent transitions.

OCTek applies the 3D gravity inversion technique of Greenhalgh & Kusznir (2007, Geophysical Research Letters), Chappell & Kusznir (2008, Geophysical Journal International) and Alvey et al (2008, Earth and Planetary Science Letters), complemented by new plate reconstructions which progressively restore the *OCTek* maps of crustal thickness back through their sea-floor spreading history to the time of breakup. Key to the *OCTek* gravity inversion technique is the incorporation into the inversion scheme of:

- The lithosphere thermal gravity anomaly resulting from breakup
- A prediction of new volcanic crustal addition during breakup

Published results have shown the importance of incorporating both these parameters in the inversion when investigating deepwater margins.

We believe that the output from *OCTek* will be of particular assistance to:

- New Ventures exploration strategy in deepwater areas, helping to determine ocean-continent transition location and discriminate crustal type prior to any specific data acquisition. *OCTek* results can also assist the planning of regional seismic surveys.
- Petroleum Systems modelling, as input to which we have produced maps of beta/thinning factor and residual continental crustal-basement across rifted margins and their ocean-continent transitions. Each *OCTek* report also provides a software tool to convert maps of beta/thinning factor into predictive maps of top basement heat-flow.

Badleys

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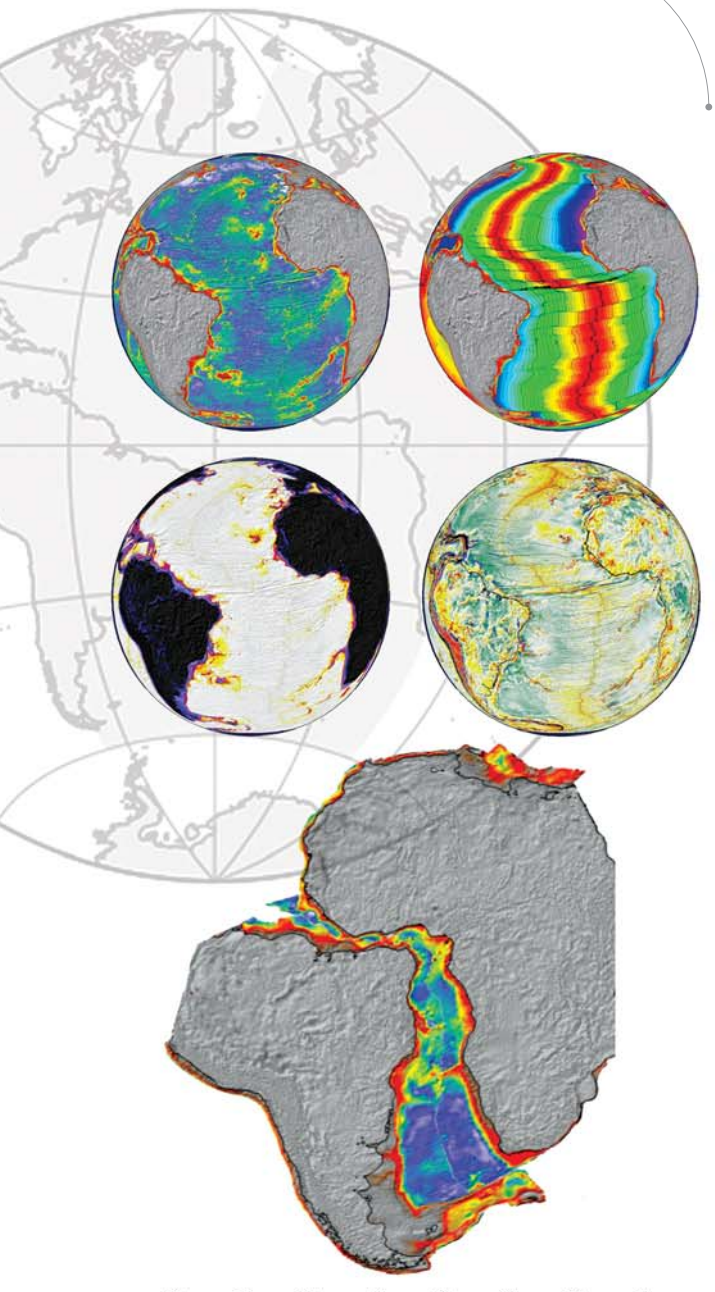

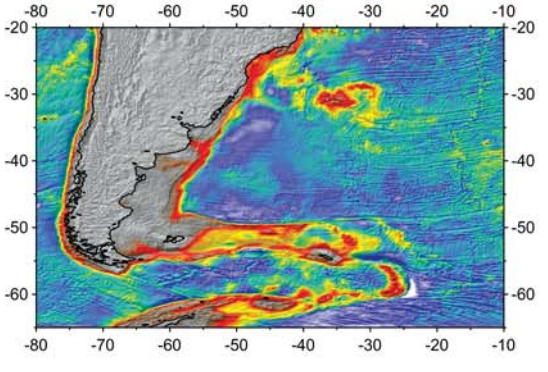

Atlantic Margins

The OCTek-Atlantic study has investigated the conjugate margins of the Atlantic between 65°S and 60°N, an area which includes the South, Equatorial and Central Atlantic. The results will therefore be of interest to those exploring or evaluating the offshore basins of:

- South America, including all of offshore Brazil
- West Africa, from South Africa north to Morocco
- Atlantic southern Europe, Iberia and Biscay
- The eastern American/Canadian seaboard

The primary output from *OCTek-Atlantic* is a comprehensive suite of digital grids for the South-Equatorial-Central Atlantic which show:

1 Depth to Moho
2 Total crustal thickness
3 Residual continental-basement crustal thickness
4 Crust and lithosphere thinning/beta factor
5 The residual thermal gravity anomaly at the present-day

The results have been tuned to local breakup age along the margins and to local crustal reference thickness. They also explore a range of plausible scenarios for the amount of volcanic addition during breakup. As well as presenting the grids in their present-day coordinate framework the crustal thickness grids have been sequentially restored, using recently-published stage-poles, from the present-day back to their palaeogeographic coordinates at the time of break-up.

The suite of digital grids is available for unrestricted use by purchasing companies and institutions and is supported by an atlas of maps, which documents the techniques and data used together with a map-plot from all of the supplied grids.

OCTek-Atlantic is based on analysis of data available in the public domain. *OCTek* gravity inversion is proven technology which has also delivered the *OCTek-Indian Ocean, OCTek-Arctic/North Atlantic* and *OCTek-Asia/Pacific* studies together with confidential results on a proprietary basis from rifted margins worldwide. A study applying the *OCTek* gravity inversion methodology to the conjugate South Australia – Antarctic margins has been made available for free public download by Geoscience Australia.

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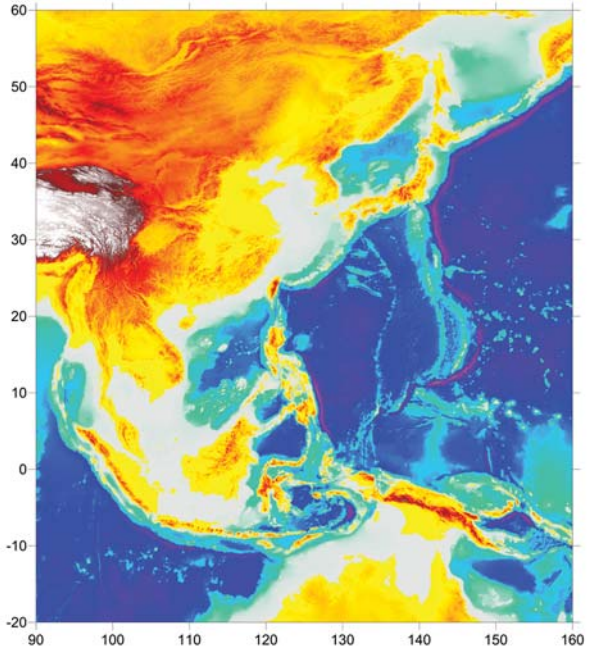

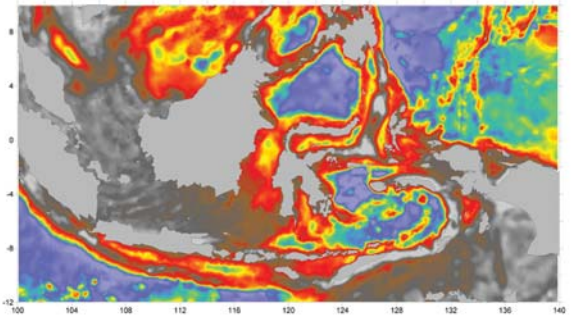

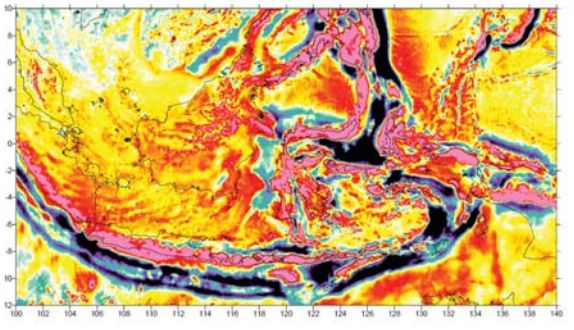

Asia-Pacific Margins

The *OCTek-Asia/Pacific* study has investigated the complex rifted margins and associated extensional basins of the Asia-Pacific region between -20°S and 60°N, an area which includes the Pacific-rimming basins of SE Asia, East Asia and NE Asia. The results will therefore be of interest to those exploring or evaluating the offshore basins of:

- Papua New Guinea & Northern Australia
- The Indonesian, Malaysian, Philippine archipelago
- Gulf of Thailand, Andaman Sea and offshore Vietnam
- South China Sea and East China Sea
- Sea of Japan and Sea of Okhotsk

The primary output from OCTek-Asia/Pacific is a comprehensive suite of digital grids for the Asia-Pacific area which show :

1 Depth to Moho
2 Total crustal thickness
3 Residual continental-basement crustal thickness
4 Crust and lithosphere thinning/beta factor
5 The residual thermal gravity anomaly at the present-day

The results have been tuned to local breakup and rift age along the margins and within the basins. The grids are also tuned to local crustal reference thickness and explore a range of plausible scenarios for the amount of volcanic addition during breakup.

The suite of digital grids is available for unrestricted use by purchasing companies and institutions and is supported by an atlas of maps, which documents the techniques and data used together with a map-plot from all of the supplied grids.

OCTek-Asia/Pacific is based on analysis of data available in the public domain. *OCTek* gravity inversion is proven technology which has also delivered the *OCTek-Atlantic, OCTek-Arctic/North Atlantic* and *OCTek-Indian Ocean* studies together with confidential results on a proprietary basis from rifted margins worldwide. A study applying the *OCTek* gravity inversion methodology to the conjugate South Australia – Antarctic margins has been made available for free public download by Geoscience Australia.

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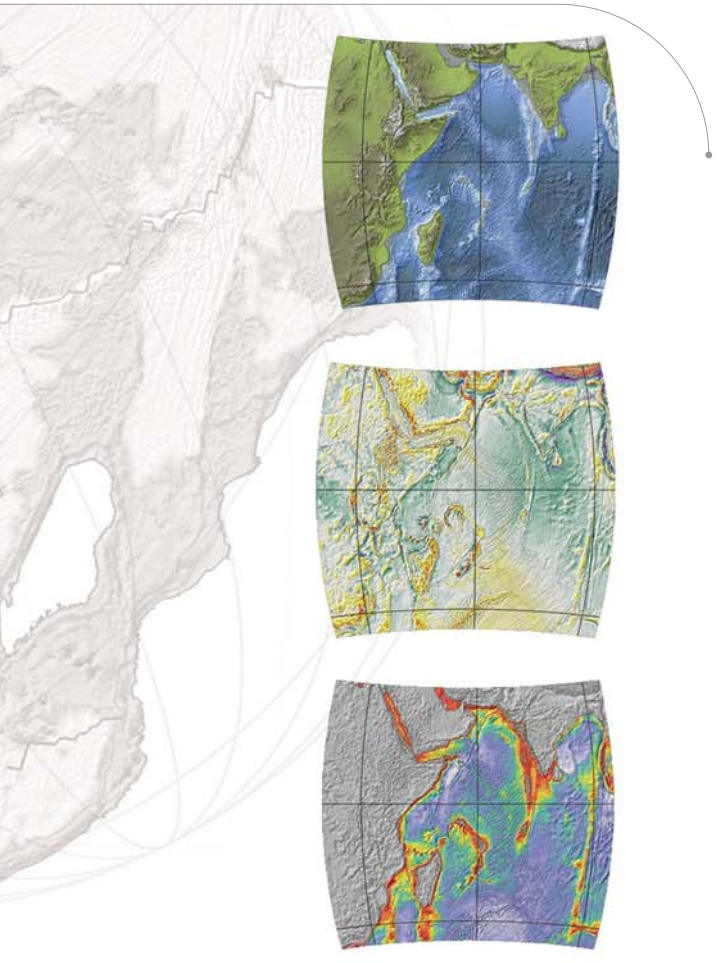

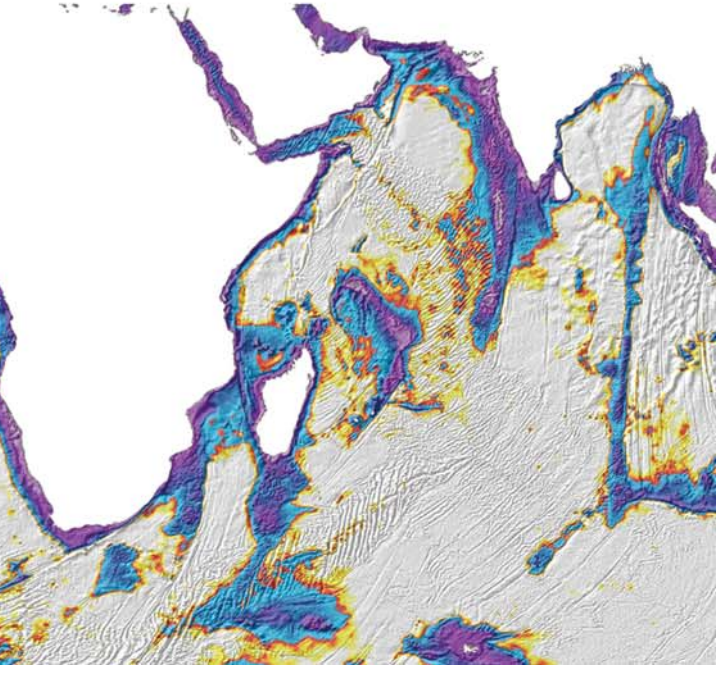

Indian Ocean Margins

The *OCTek-Indian Ocean* study has investigated the rifted margins, rift basins and micro-continents of the Indian Ocean, from its northern margin south to 35°S. The results will therefore be of interest to those exploring or evaluating the offshore basins of:

- The east and west coasts of India, including the Bay of Bengal and Arabian Sea
- East Africa north to the Gulf of Aden
- Madagascar and the Mozambique Channel
- The Seychelles microcontinent and Mascarene Basin

The primary output from *OCTek-Indian Ocean* is a comprehensive suite of digital grids for the Indian Ocean which show :

1 Depth to Moho
2 Total crustal thickness
3 Residual continental-basement crustal thickness
4 Crust and lithosphere thinning and beta factor
5 The residual lithosphere thermal gravity anomaly at the present-day

The results have been tuned to local breakup ages along the margins and to local crustal reference thickness. They also explore a range of plausible scenarios for the amount of volcanic addition during breakup. As well as presenting the grids in their present-day coordinate framework the crustal-thickness grids have been sequentially restored, from the present-day back to their palaeogeographic coordinates at the time of break-up, shedding new light in particular on the complex breakup of the East Africa – Madagascar – Seychelles – West India margins. The restorations also extend south to include the Antarctic margin.

The suite of digital grids is available for unrestricted use by purchasing companies and institutions and is supported by an atlas of maps, which documents the techniques and data used together with a map-plot from all of the supplied grids.

OCTek-Indian Ocean is based on analysis of data available in the public domain. *OCTek* gravity inversion is proven technology which has also delivered the *OCTek-Atlantic, OCTek-Arctic/North Atlantic* and *OCTek-Asia/Pacific* studies together with confidential results on a proprietary basis from rifted margins worldwide. A study applying the *OCTek* gravity inversion methodology to the conjugate South Australia – Antarctic margins has been made available for free public download by Geoscience Australia.

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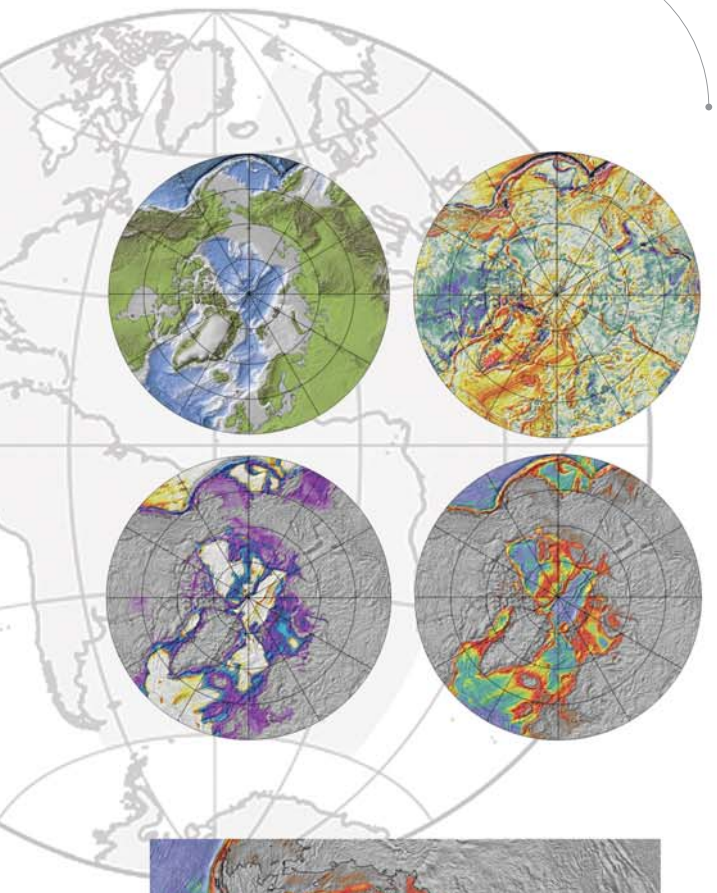

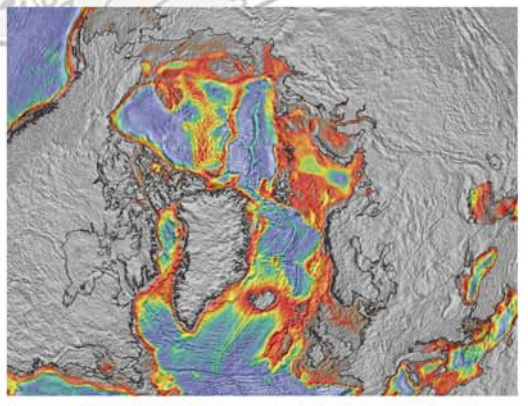

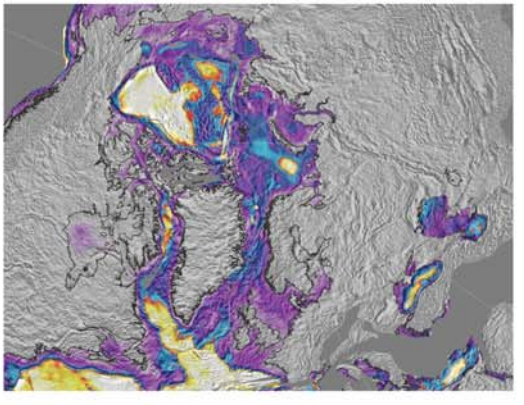

Arctic / North Atlantic Margins

The *OCTek-Arctic/North Atlantic* study has investigated the rifted margins and basins of the Arctic and North Atlantic, south to 50°N, where the study joins with *OCTek-Atlantic*. The results will therefore be of interest to those exploring or evaluating the offshore basins of

- Arctic Canada and Alaska, including the Beaufort and Chukchi Seas
- Arctic Russia, including the East Siberia, Laptev, Kara and Barents Seas
- Arctic Norway and Greenland, including the Spitsbergen area
- The Norwegian and East Greenland Atlantic margins, including Jan Mayen
- West Greenland, including Baffin Bay and the Labrador Sea
- The western UK/Ireland Atlantic margin

The primary output from *OCTek-Arctic/North Atlantic* is a comprehensive suite of digital grids for the Arctic/North Atlantic area which show :

1 Depth to Moho
2 Total crustal thickness
3 Residual continental-basement crustal thickness
4 Crust and lithosphere thinning and beta factor
5 The residual lithosphere thermal gravity anomaly at the present-day

The results have been tuned to local breakup/rift ages along the margins and to local crustal reference thickness. They also explore a range of plausible scenarios for the amount of volcanic addition during breakup. As well as presenting the grids in their present-day coordinate framework the crustal thickness grids have been sequentially restored to the mid-Cretaceous, using recent stage-poles. This restores the sea-floor spreading in the North Atlantic, Eurasia Basin and Baffin Bay.

The suite of digital grids is available for unrestricted use by purchasing companies and institutions and is supported by an atlas of maps, which documents the techniques and data used together with a map-plot from all of the supplied grids.

OCTek-Arctic/North Atlantic is based on analysis of data available in the public domain. *OCTek* gravity inversion is proven technology which has also delivered the *OCTek-Atlantic, OCTek-Indian Ocean* and *OCTek-Asia/Pacific* studies together with confidential results on a proprietary basis from rifted margins worldwide. A study applying the *OCTek* gravity inversion methodology to the conjugate South Australia – Antarctic margins has been made available for free public download by Geoscience Australia.

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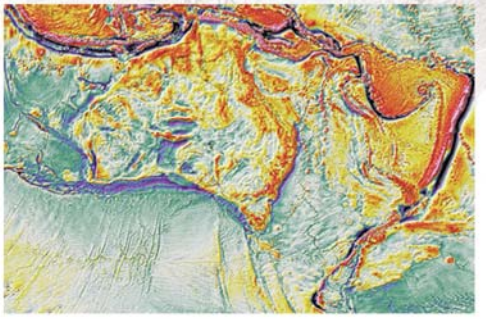

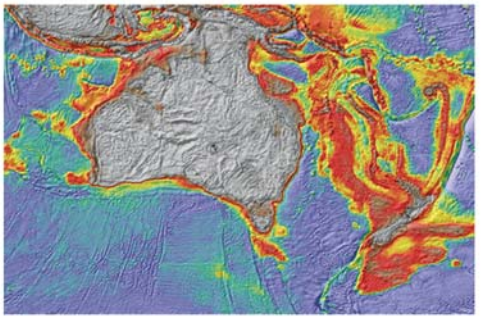

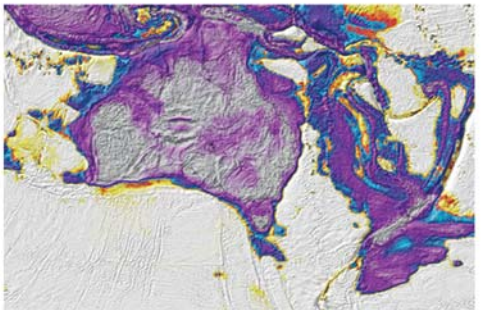

Australasia Margins

The *OCTek-Australasia* study has investigated the rifted margins and offshore basins of Australasia. It covers the region defined by 0°N, 60°S, 90°E & 190°E and joins onto the existing *OCTek-Asia-Pacific & OCTek-Indian Ocean studies*. The *OCTek-Australasia* results will be of interest to those exploring or evaluating the offshore basins of the:

- Australian Bight, Gippsland, Bass and Otway Basins,
- Perth, Carnarvon, Browse and Bonaparte Basins,
- North Australia / Indonesia including the Timor, Arafura, Solomon and Coral Seas
- New Zealand including Lord Howe Rise and the margins of the Tasman Sea

The primary output from *OCTek-Australasia* is a comprehensive suite of digital grids for the Australasian region which show :

1. Depth to Moho
2. Total crustal thickness
3. Residual continental-basement crustal thickness
4. Crust and lithosphere thinning and beta factor
5. The residual lithosphere thermal gravity anomaly at the present-day

The results have been tuned to local breakup/rift ages along the margins and to local crustal reference thickness. They also explore a range of plausible scenarios for the amount of volcanic addition during breakup. As well as presenting the grids in their present-day coordinate framework, the crustal thickness grids have been sequentially restored to the end Jurassic, using recently-published stage-poles, for sea-floor spreading in the Coral Sea, Tasman Sea & the Southern Ocean.

The suite of digital grids is available for unrestricted use by purchasing companies and institutions and is supported by an atlas of maps, which documents the techniques and data used together with a map-plot from all of the supplied grids.

OCTek-Australasia is based on analysis of data available in the public domain. *OCTek* gravity inversion is proven technology which has also delivered the *OCTek-Atlantic, OCTek-Indian Ocean, OCTek-Asia/Pacific & OCTek-Arctic & N.Atlanic* studies together with confidential results on a proprietary basis from rifted margins worldwide. A study applying the *OCTek* gravity inversion methodology to the conjugate South Australia – Antarctic margins has been made available for free public download by Geoscience Australia.

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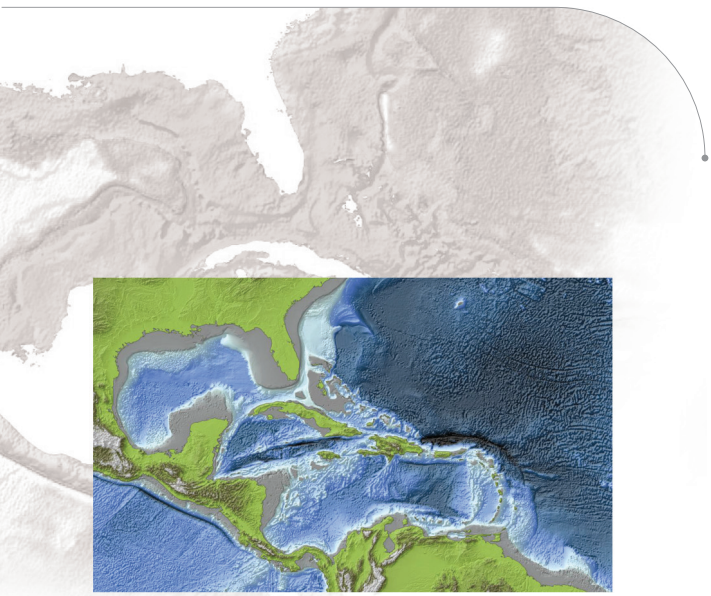

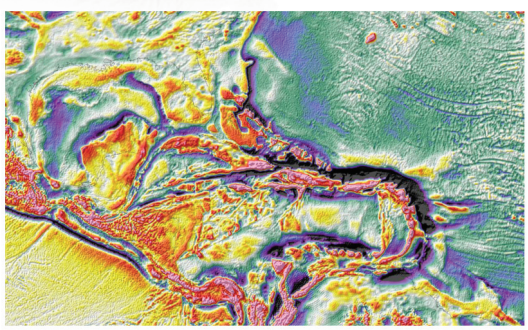

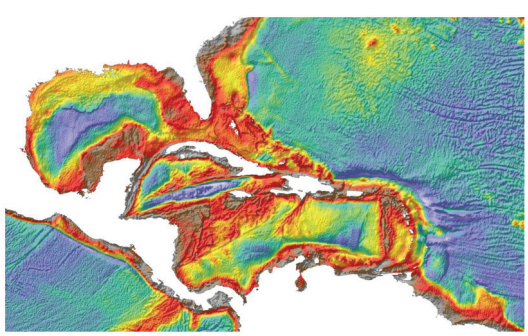

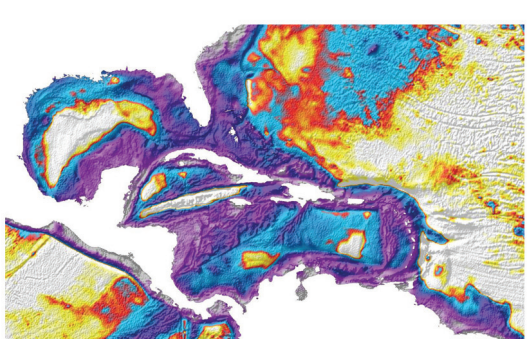

Gulf of Mexico & Caribbean Margins

The *OCTek-GOM-Caribbean* study has investigated the rifted margins and basins of the Gulf of Mexico and the Caribbean, within the region defined by 5-35°N and 50-100°W, where the study joins with *OCTek-Atlantic*. The results will therefore be of interest to those exploring or evaluating the offshore basins of:

- Gulf of Mexico
- Bay of Campeche
- Yucatan Basin and Cayman Trough
- Nicaragua Rise, Colombia Basin, Venezuela Basin
- Demerara Plateau
- Florida-Bahamas Platform and Blake Plateau

The primary output from *OCTek- GOM-Caribbean* is a comprehensive suite of digital grids for the Gulf of Mexico and the Caribbean area which show:

1. Depth to Moho
2. Total crustal thickness
3. Residual continental-basement crustal thickness
4. Crust and lithosphere thinning and beta factor
5. The residual lithosphere thermal gravity anomaly at the present-day

The results have been tuned to local breakup/rift ages along the margins and to local crustal reference thickness. They also explore a range of plausible scenarios for the amount of volcanic addition during breakup.

The suite of digital grids is available for unrestricted use by purchasing companies and institutions and is supported by an atlas of maps, which documents the techniques and data used together with a map-plot from all of the supplied grids.

OCTek- GOM-Caribbean is based on analysis of data available in the public domain. *OCTek* gravity inversion is proven technology which has also delivered the *OCTek-Atlantic, OCTek-Indian Ocean, OCTek-Asia/Pacific, OCTek-Arctic* and *OCTek Australasia* studies together with confidential results on a proprietary basis from rifted margins worldwide. A study applying the *OCTek* gravity inversion methodology to the conjugate South Australia – Antarctic margins has been made available for free public download by Geoscience Australia.

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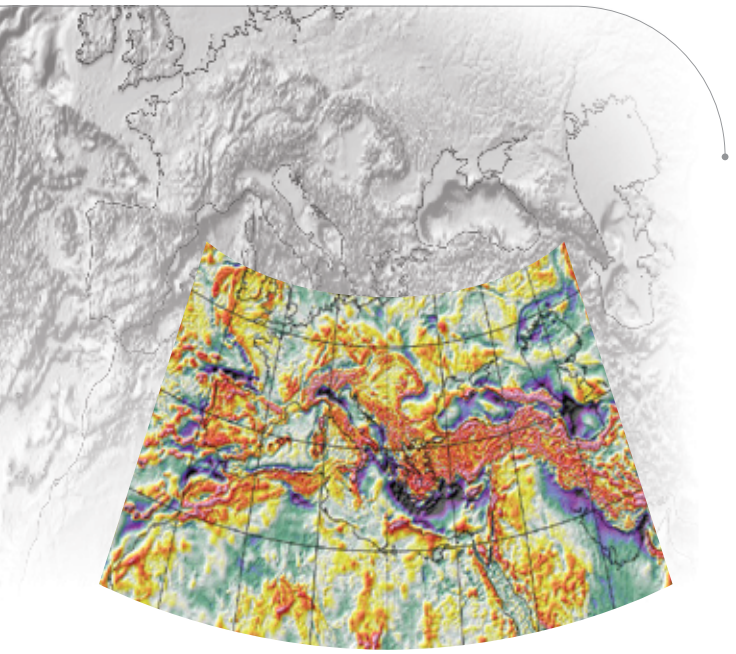

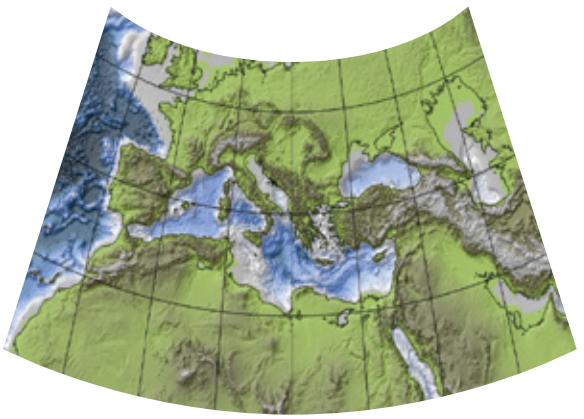

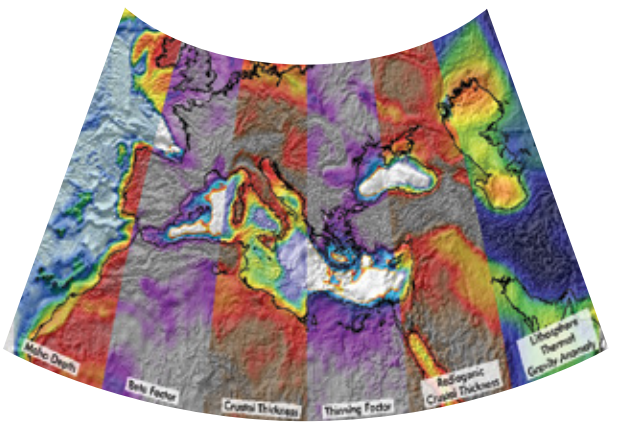

Mediterranean Basins

The *OCTek-Mediterranean* study has investigated the rifted margins and offshore basins of the Mediterranean, Black Sea & Caspian Sea. It covers the region defined by 20° - 55°N, 20°W - 60°E and joins onto the existing *OCTek-Atlantic & OCTek-Indian Ocean studies*. The *OCTek-Mediterranean* results will be of interest to those exploring or evaluating the offshore basins of:

- The whole of the Mediterranean Sea,
- The Caspian Sea,
- The Black Sea,
- Offshore Morrocco & the Bay of Biscay

The primary output from *OCTek-Mediterranean* is a comprehensive suite of digital grids for the Mediterranean, Black Sea and Caspian Sea region which show :

1. Depth to Moho
2. Total crustal thickness
3. Residual continental-basement crustal thickness
4. Crust and lithosphere thinning and beta factor
5. The residual lithosphere thermal gravity anomaly at the present-day

The results have been tuned to local breakup/rift ages within the basins and to local crustal reference thickness. They also explore a range of plausible scenarios for the amount of volcanic addition during rifting and breakup as well as a sensitivity to sediment thickness.

The suite of digital grids is available for unrestricted use by purchasing companies and institutions and is supported by an atlas of maps, which documents the techniques and data used together with a map-plot from all of the supplied grids.

OCTek-Mediterranean is based on analysis of data available in the public domain. *OCTek* gravity inversion is proven technology which has also delivered the *OCTek-Atlantic, OCTek-Indian Ocean, OCTek-Asia/Pacific, OCTek-Arctic & N.Atlanic, OCTek-Australasia and OCTek-Gulf of Mexico* studies together with confidential results on a proprietary basis from rifted margins worldwide.

A study applying the *OCTek* gravity inversion methodology to the conjugate South Australia – Antarctic margins has been made available for free public download by Geoscience Australia.

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