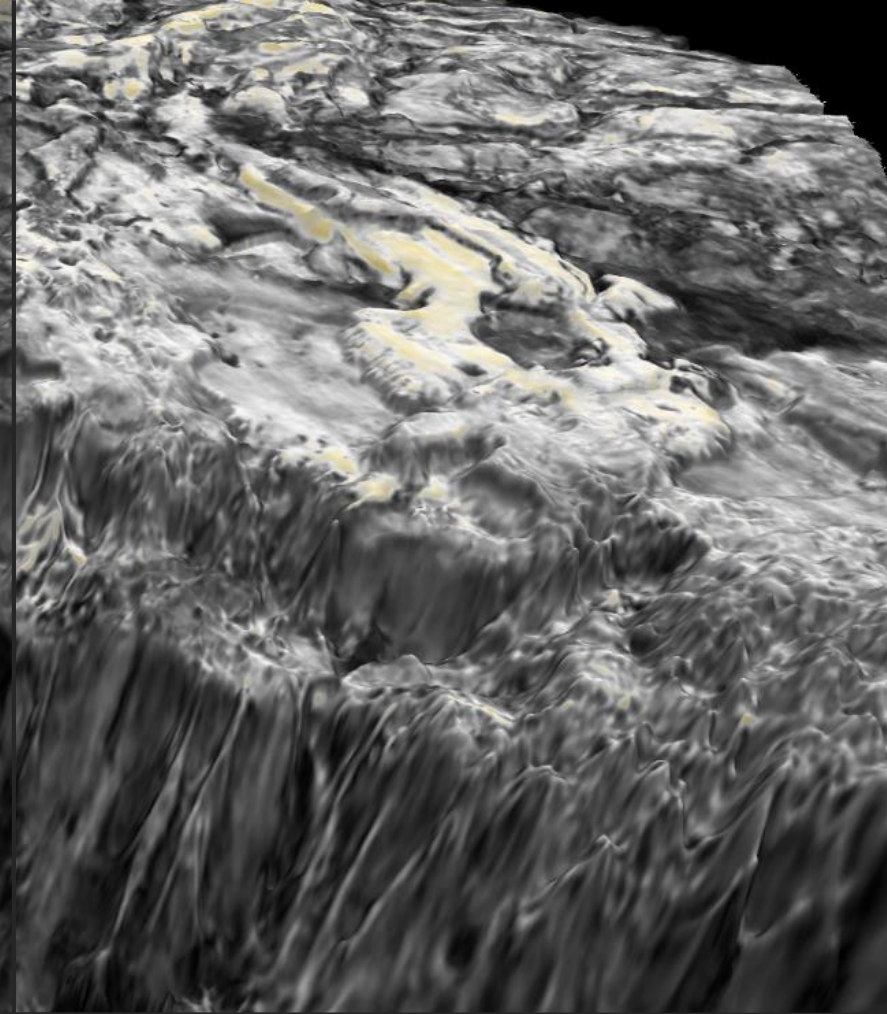




W 264°

Volcanic Margin Petroleum Prospectivity Phase 2



vmapp

Volcanic Margin
Petroleum Prospectivity 2



Volcanic Basin Petroleum Research



DougalEARTH
Ltd.

Project Proposal
09/08/2018
www.vbpr.no

>> Volcanic Margin Petroleum Prospectivity Phase 2

vmapp2

Project aims: New understanding and opportunities in global volcanic margin petroleum systems building on the VMAPP success

Audience: Petroleum companies exploring rifted margins and volcanic basins - targeted information for explorers, seismic processors, petrophysicists, basin modelers, and drilling engineers

Project scope:

- Interactive global database of volcanic basins, discoveries, and fields
- Regional volcanic basin modules including basin architecture, igneous petroleum systems analysis, and play concepts
- Improved volcanic basin exploration and development strategies
- Frontier scientific research targeting volcanic basin prospectivity challenges

Project group: Three companies (VBPR, DougalEARTH and TGS) with long and complimentary experience in petroleum exploration of volcanic margins and volcanic basins world-wide

Deliverables: Interactive global volcanic basin database, Basin and Research modules, in-house presentations and training

Additional activities: Field trips, consulting, in-house training and workshops

Duration: Three-year project (2018-2021)

Contact: Please email Magnar Ullnæss at VBPR (magnar@vbpr.no) for a copy of the full project outline and to arrange a presentation at your company



Basin Modules

Global volcanic basins database including key regional volcanic basin modules

Key regions

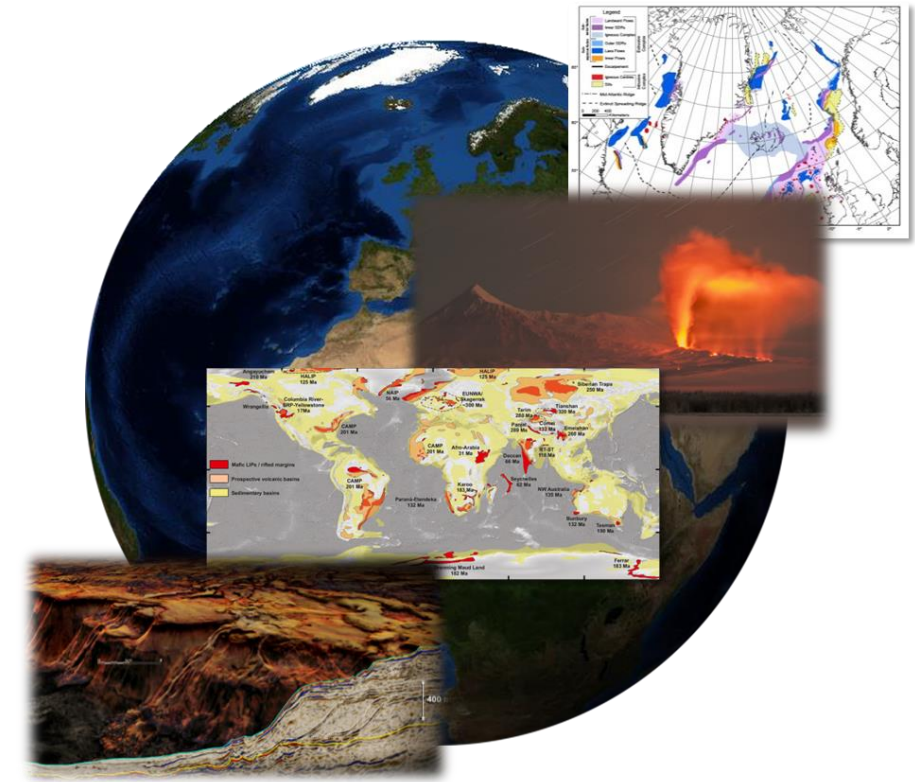
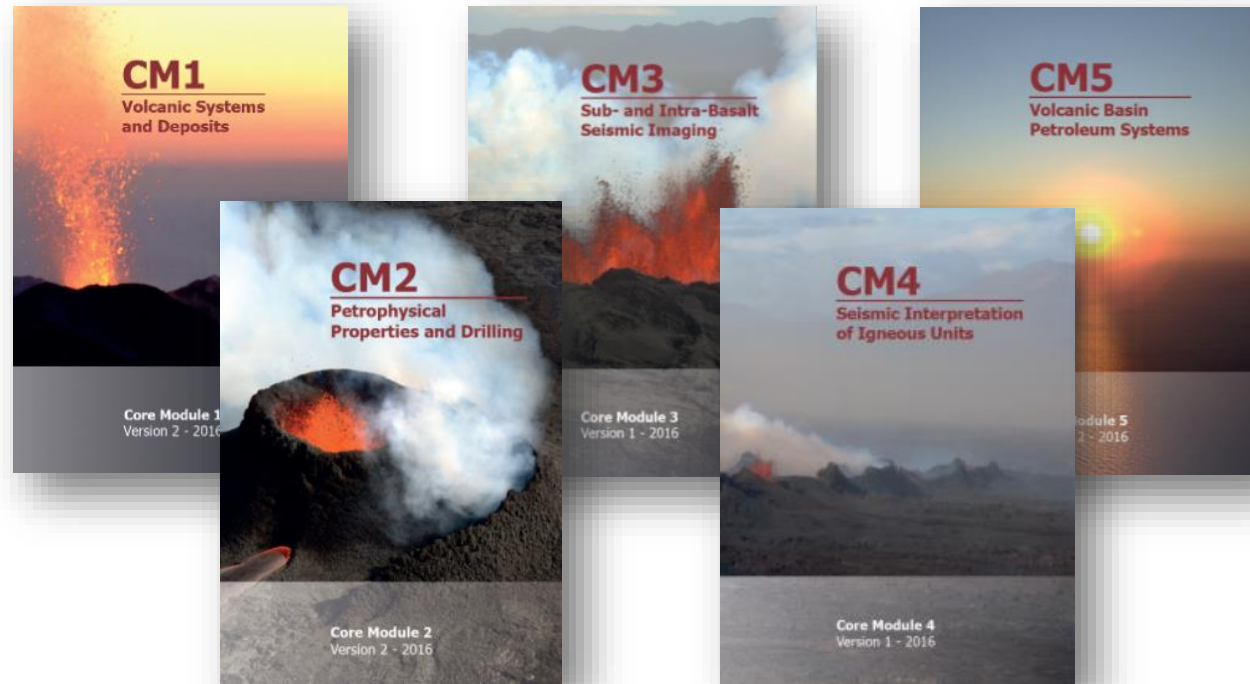
NE Atlantic
S Atlantic
W India/E Africa
Siberia
(EP feedback driven)

Research Modules

Frontier research focused on outstanding volcanic prospectivity issues

Volcanic basin seismic interpretation
Igneous related reservoirs
Intra-cratonic basins and intercontinental rift basins
Hydrothermal and super-critical fluids
Volcanic basin modelling

VMAPP2 will build on the state of the art understanding of volcanic basins developed in the VMAPP multi-client project



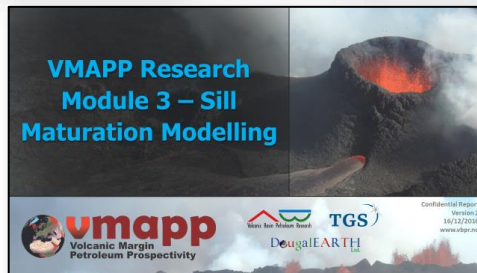
VMAPP Phase 1 duration: 2013-2016

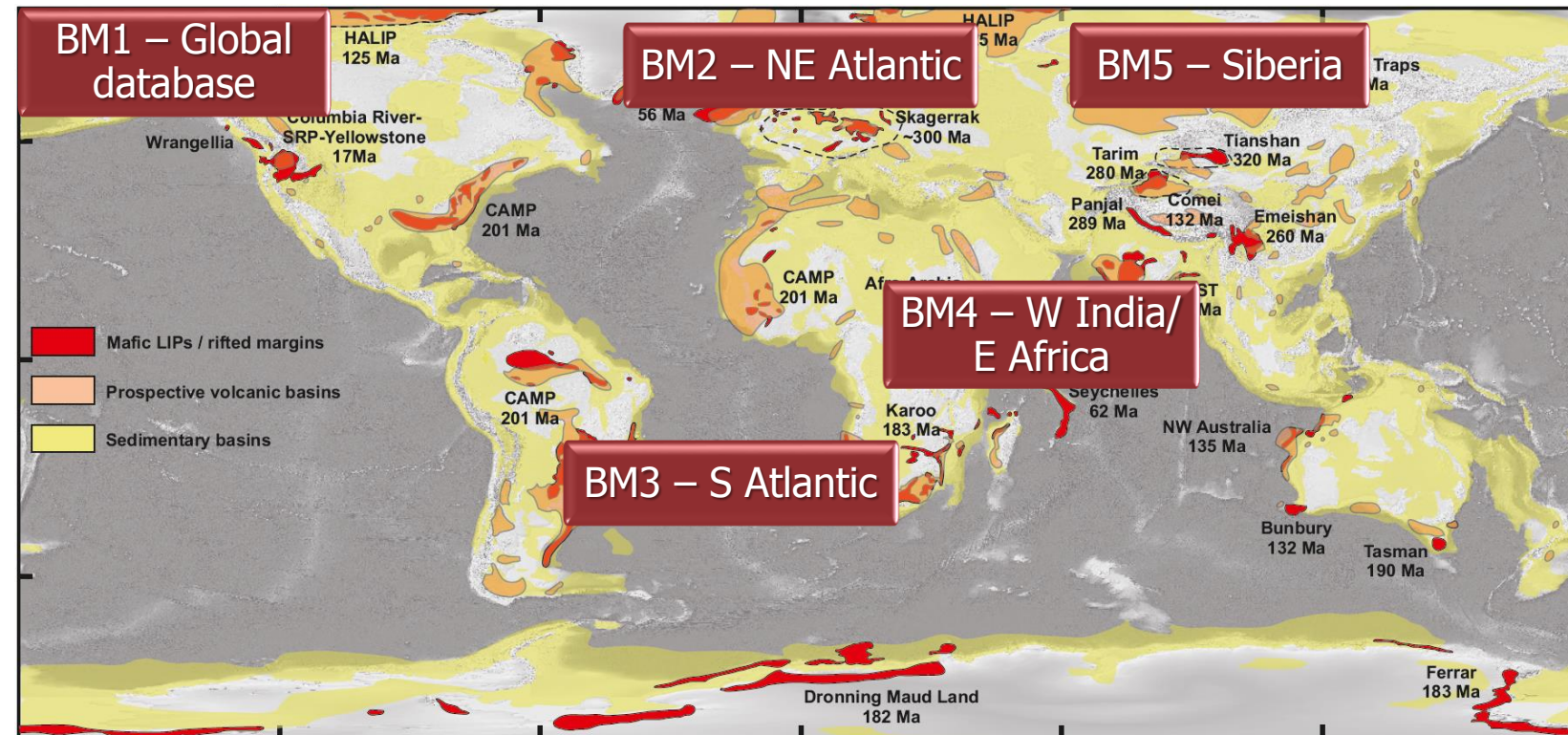
Status: Completed and available

Deliverables: Five Core Modules (CM) training manuals and associated ppt's

Five Research Modules (RM), pdf reports (9), ppt's (3), and volcanic petrophysical database

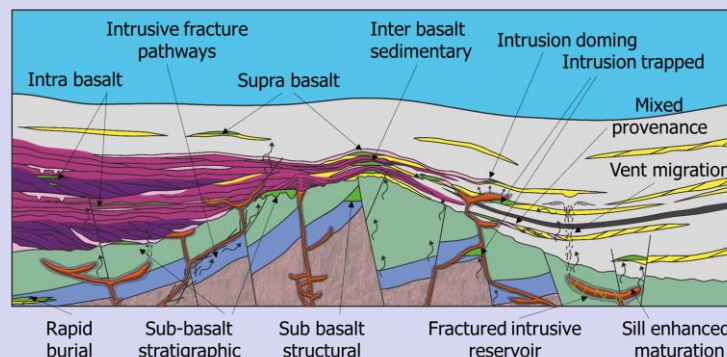
8 participating companies





BM1 – Global database

- Volcanic basin classification and mapping
- Igneous discoveries and fields
- Reservoir and reserves information
- Volcanic basin play types
- Searchable wiki-style database
- Atlas of outcrop analogues



Regional Basin Modules

Regional basin architecture and development

Igneous-related play concepts

Petroleum systems analysis - with igneous focus

Additional consulting on sub-regions and proprietary data

NE Atlantic

Key areas: Vøring and Møre basins, Faroe-Shetland Basin, NE Greenland, Jan Mayen/Iceland, W Barents Sea

Volcanic basin setting: Volcanic rifted margin, SDRs, outer high's, transform margins, plume influence, dynamic topography, excess temperatures, NAIP LIP

Volcanic play elements: Sub-basalt, basaltic volcanic reservoirs, inter-basalt (fluvial/shallow marine), forced folds, intrusives, hydrothermal vents

Siberia

Key areas: Tunguska Basin (Kamo Arch, Angara-Lena), West Siberian Basin, East Barents Basin

Volcanic basin setting: Intra-cratonic volcanic basin, Cambrian to Pre-Cambrian intruded host rocks, Siberian Traps and High-Arctic LIP's

Volcanic play elements: Carbonate and evaporate reservoirs, hydrothermal vents, sill intrusions

S Atlantic

Key areas: Brazilian margin (Campos/Santos/Espírito Santo), Angola, Namibian margin

Volcanic basin setting: Volcanic rifted margin, salt/carbonates, SDR's/outer highs, Parana-Etendeka LIP, post-breakup magmatism

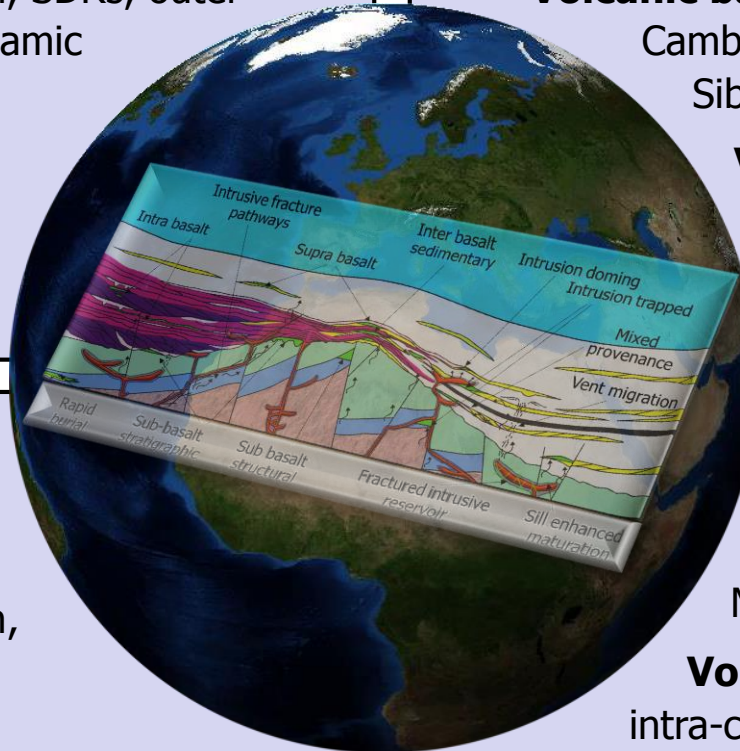
Volcanic play elements: Sub-salt, volcanic reservoirs (basaltic/silicic), intrusive reservoirs, hydrothermal vents, volcanoclastic, inter-basalt (aeolian/carbonate)

W India and E Africa

Key areas: Western Indian Margin, Deccan onshore, SE India offshore/Sri Lanka, Madagascar/East Africa link

Volcanic basin setting: Volcanic rifted margin, intra-cratonic rifts, plume influence, foreland basin, Deccan LIP, Reunion plume

Volcanic play elements: Sub-basalt, volcanic reservoirs (basalt/silicic), inter-basalt (fluvial/marine), structural (e.g. faulted Deccan basement), volcanoclastics



Tasks

RM6 | Volcanic basin seismic interpretation

- Acquisition technologies / processing
- 3D igneous seismic interpretation
- 3D volcanic surfaces
- Key facies mapping (sub-aqueous/sub-aerial/intrusive)
- Integrated outcrop analogue modelling

RM7 | Igneous related reservoirs

- Tight volcanic reservoirs
- Compositional control and felsic volcanic reservoirs
- Hydrothermal alteration and secondary porosity
- Fractured reservoirs and host rock fracturing
- Inter-lava sedimentary reservoirs
- Contact zones and reservoir compartmentalization

RM8 | Intracratonic basins and intercontinental rift basins

- Key styles of volcanism
- Plume/delamination origin
- Neuquén, Karoo, Siberia, Columbia River
- Amazon basins (Solimões, Amazonas, Parnaíba)
- Relation to pre-, syn- and post-volcanic sediments
- Models of basin evolution

RM9 | Hydrothermal and super-critical fluids

- Intrusion induced maturation
- Super-critical fluid effects
- Volcanic/carbonate/evaporite reactions
- Fluid expulsion around sills
- Modeling hydrothermal systems
- Magmatic versus non-magmatic CO₂

RM10 | Volcanic basin modelling

- Anisotropy in evolving volcanic fracture networks
- Local to margin scale volcanic seals
- Differential compaction and overpressure
- Fracture gradient and burial curve predictions
- Burial induced stress localization

Key personnel

RM6 coordinator: Sverre Planke

- Dougal Jerram (DougalEARTH/CEED)
- John Millett (VBPR)
- Olivier Galland (Univ. of Oslo)
- Reidun Myklebust (TGS)
- Dwarika Maharajan, Ben Manton (VBPR)

RM7 coordinator: John Millett

- Dougal Jerram (DougalEARTH/CEED)
- Dave Healy (Univ. of Aberdeen)
- Univ. of Hawaii / ICDP
- Sverre Planke (VBPR)
- Olivier Galland (Univ. of Oslo)
- Karen Mair (Univ. of Oslo)

RM8 coordinator: Dougal Jerram

- John Millett (VBPR)
- Henrik Svensen (Univ. of Oslo)
- John Wolf (Pulman, USA)
- Alexander Polozov (CEED/Moscow)
- Sverre Planke (VBPR)
- Olivier Galland (Univ. of Oslo)

RM9 coordinator: Sverre Planke

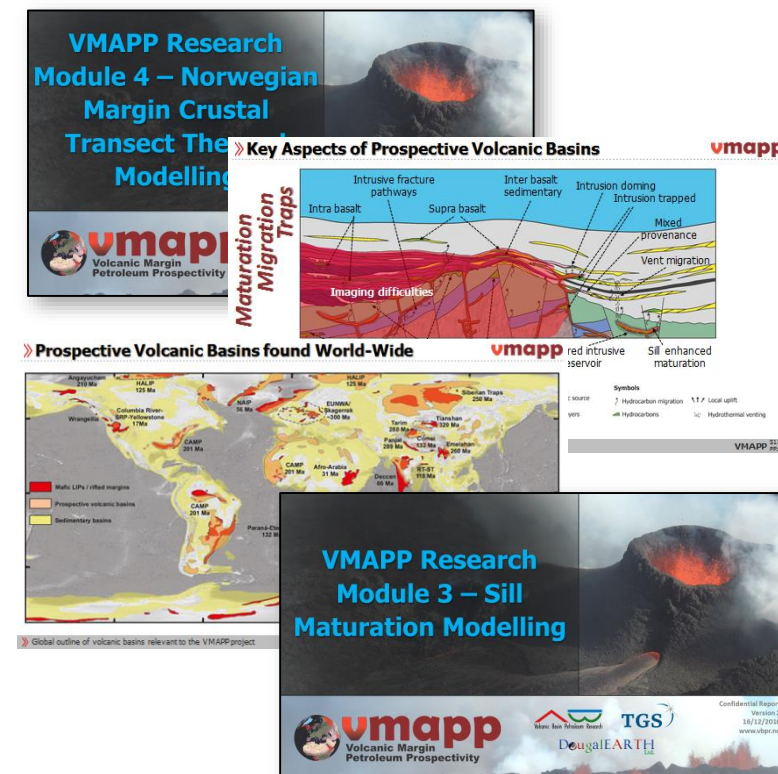
- Karthik Iyer, Dani Schmid (Geomodeling Solutions)
- John Millett (VBPR)
- Dougal Jerram (DougalEARTH/CEED)
- Henrik Svensen (Univ. of Oslo)
- Institute for Energy Technology (Norway)

RM10 coordinator: John Millett

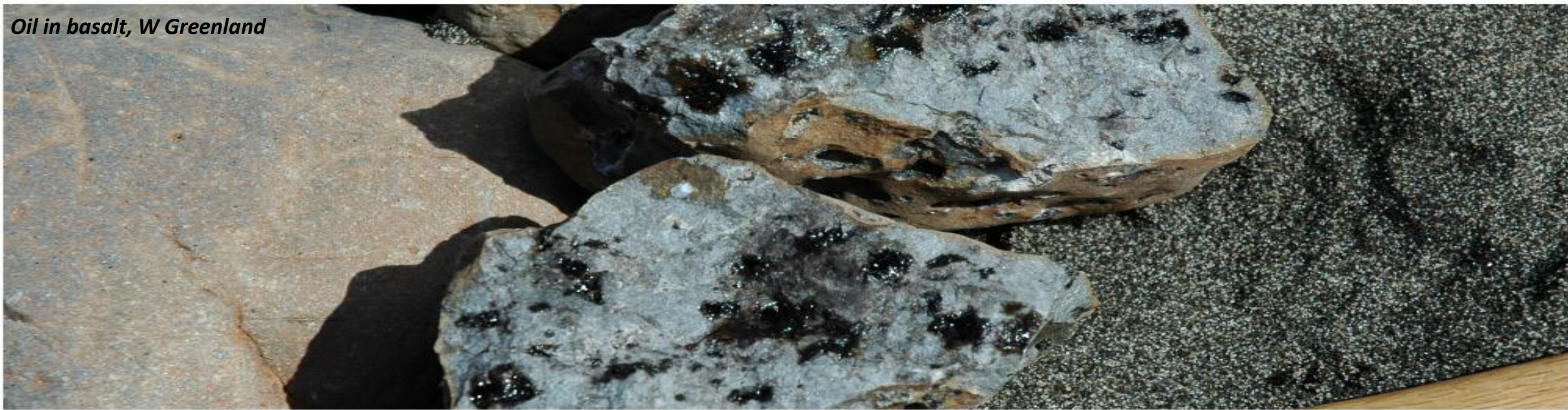
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- Dave Healy (Univ. of Aberdeen)
- Sverre Planke (VBPR)
- Dougal Jerram (DougalEARTH/CEED)
- Olivier Galland (Univ. of Oslo)

Research Modules

Building on the successful RM1-5 from VMAPP1, the new RM's provide targeted research to improve petroleum prospectivity in volcanic basins



Oil in basalt, W Greenland



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