Namibia Oil and Gas Conference

3rd Edition

From exploration to action: Positioning Namibia as the next energy frontier

MPOG - Microbial Prospecting for Oil and Gas AND Geochemical Soil Analysis

Advanced surface exploration toolsets

HOST

economic association of namibia ean

IN PARTNERSHIP WITH

NIPDB Namibia Investment Promotion & Development Board

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SNC INCORPORATED

RHINO RESOURCES

MicroPro GmbH
Microbiological Laboratories

Jakob Kretschmer

www.micropro.de

Overview

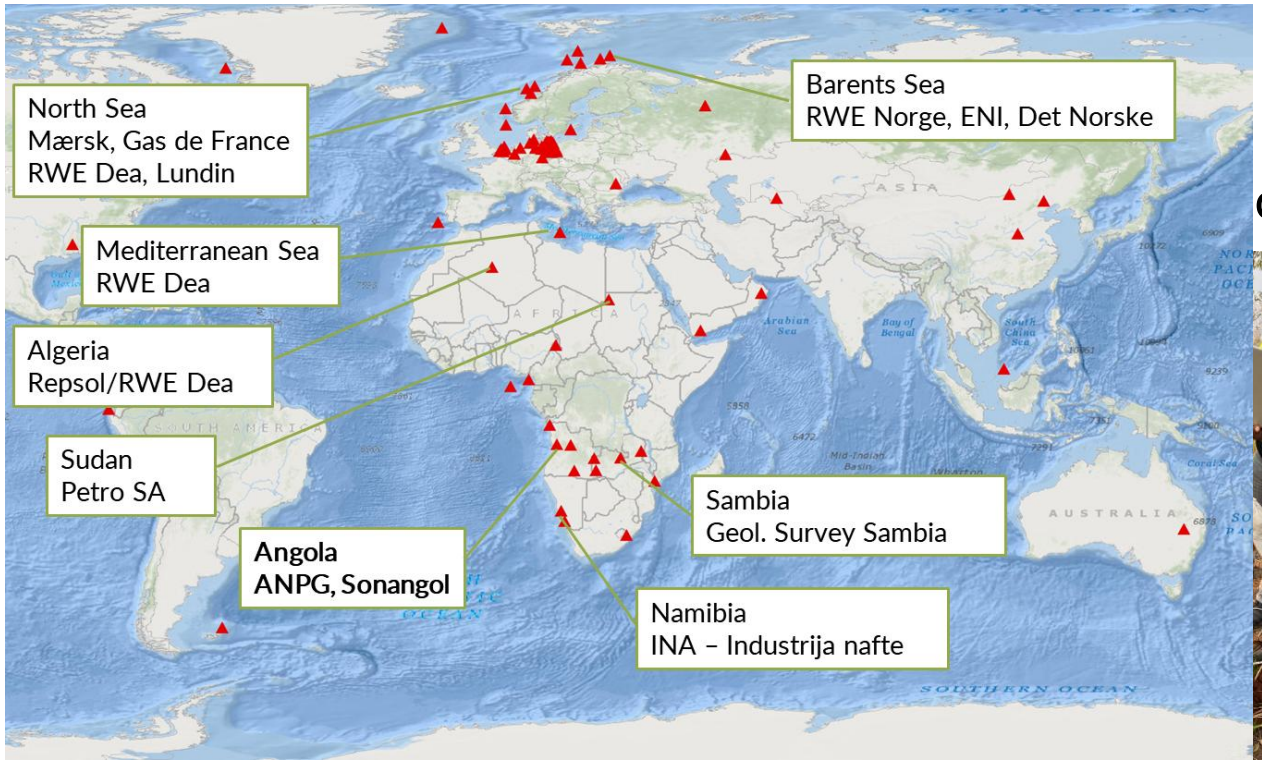
(1) MicroPro company portrait

(2) Surface exploration – MPOG / Geochemistry

(3) Field and laboratory workflow

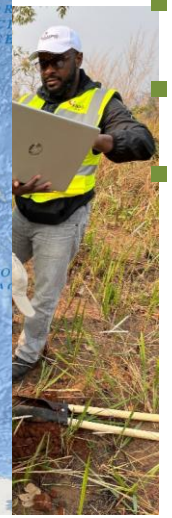
(4) Results

MicroPro GmbH – Microbiological Laboratories

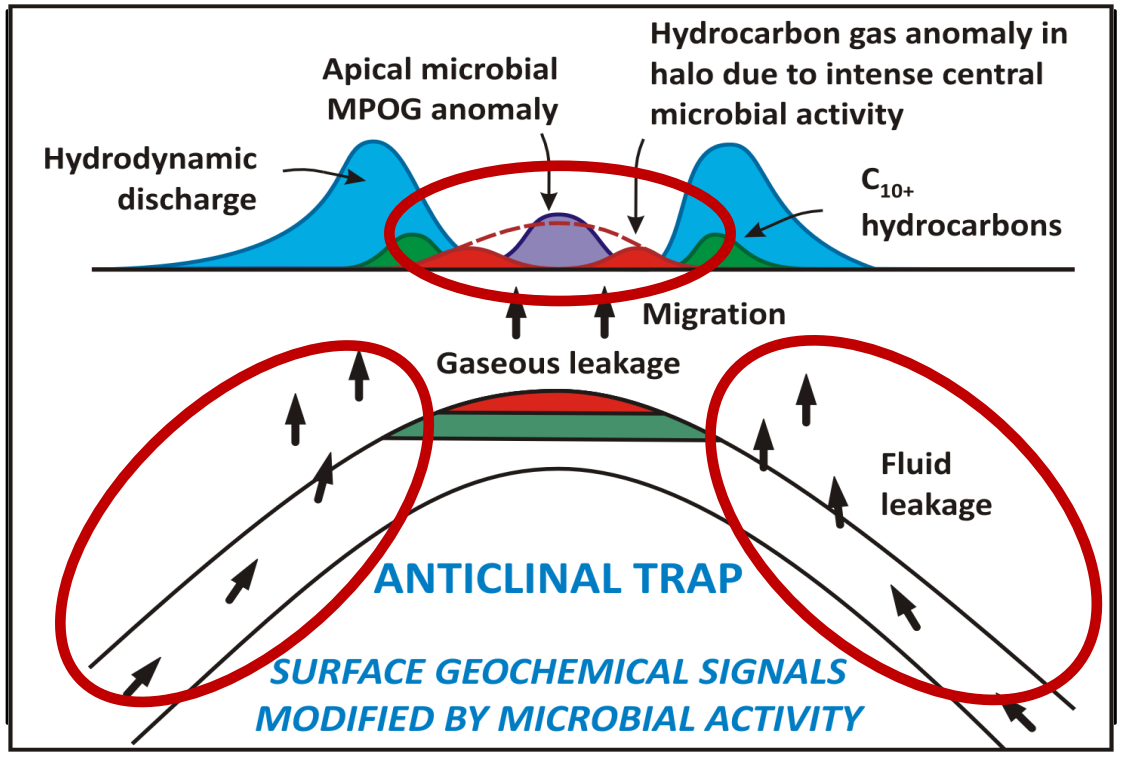


opment

- *Ge… …ogy*
- *Ge… …urf*
- *Oi… …bio…*
- *Bi… …r services*



Basics of surface exploration - MPOG / Geochemistry



modified after Schumacher, 1996

- Identification and Quantification of hydrocarbon signals by gas chromatography (Direct)
- Amplification of hydrocarbon signals by HC-degrading microorganisms in soil (Indirect)
- For onshore and offshore exploration with minimal environmental impact
- Application from Wildcat to reservoir characterization

Transport processes:

- *Diffusion and Osmosis*
- *Transport by water*
- *Buoyant transport*

(Klusman 1993, 2008)

Driving forces:

- *Pressure gradients*
- *Buoyancy*

Vertical Migration Rate:

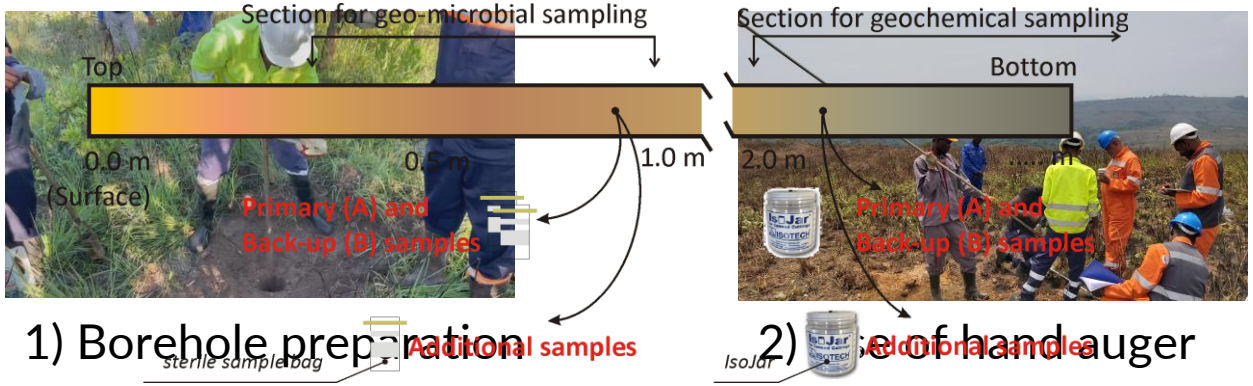
- 0.6 – 2m / day

(Rice et al. 2002, AAPG Studies in Geology, 48:157-174)

From exploration to action: Positioning Namibia as the next energy frontier

		Geology & Geophysics	Geochemistry Surface exploration	MPOG Surface exploration
Surface	Mineral Composition	Yes	No	Yes
	HC-Seeps	Yes	Yes	Yes
Cap-Rock	Presence	Yes (shallow)	(Yes – approx via C-Iso)	No
	Efficiency	No	No	Yes
Reservoir	Presence	Yes (shallow)	Yes	No
	Porosity / Permeability	No	No	No
	HC-Content	No	Yes - approx	Yes – approx.
Source Rock	Presence	Yes (shallow)	Yes	No
	Maturity	No	No	Yes
	Migration	No	(Yes – approx via C-Iso)	Yes - approx
	Genetic Potential	No	No	No
Structure	Type	Yes (shallow)	No	No
	Relief	Yes (shallow)	No	No
	Depth	Yes (shallow)	No	No
	Closure	Yes (shallow)	No	No
	Stratigraphic trap	Yes (shallow)	(Yes – approx via C-Iso)	Yes
		2 (10)	***4 (7)***	**7**

Surface Exploration – Field workflow



1) Borehole preparation

2) Use of hand auger

3) MPOG sampling

4) IsoJar sampling

5) Addition of stabilizers

6) Final sample set

Field survey – Kassanje basin, Angola

Field team convoy

Wet area

Bitumen outcrops

Sampling team

Field survey – Barents Sea, Norway

e.g. MV SEA PROFILER (Gardline UK)
Hydrographic and Geophysical Survey Vessel

Bottom Grab Sampler
Penetration: 0.2 – 1 m

Vibrocorer
Penetration: 2 – 6 m

Piston Corer
Penetration: 1 - 6 m

MI Shipping WhirlPak

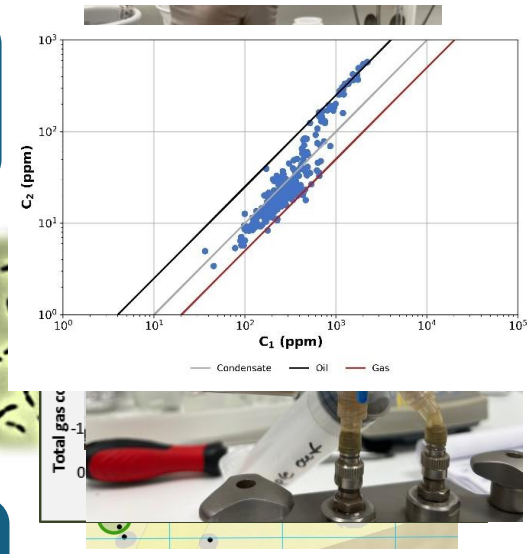
Sample Intake WhirlPak IsoJar

Shipping IsoJar OG

Preparation Weighing/Mixing/ Suspension

Cultivation MPN / Microbial activity

Analysis Gas / Oil indices



Integrated Interpretation

Gas extraction Headspace

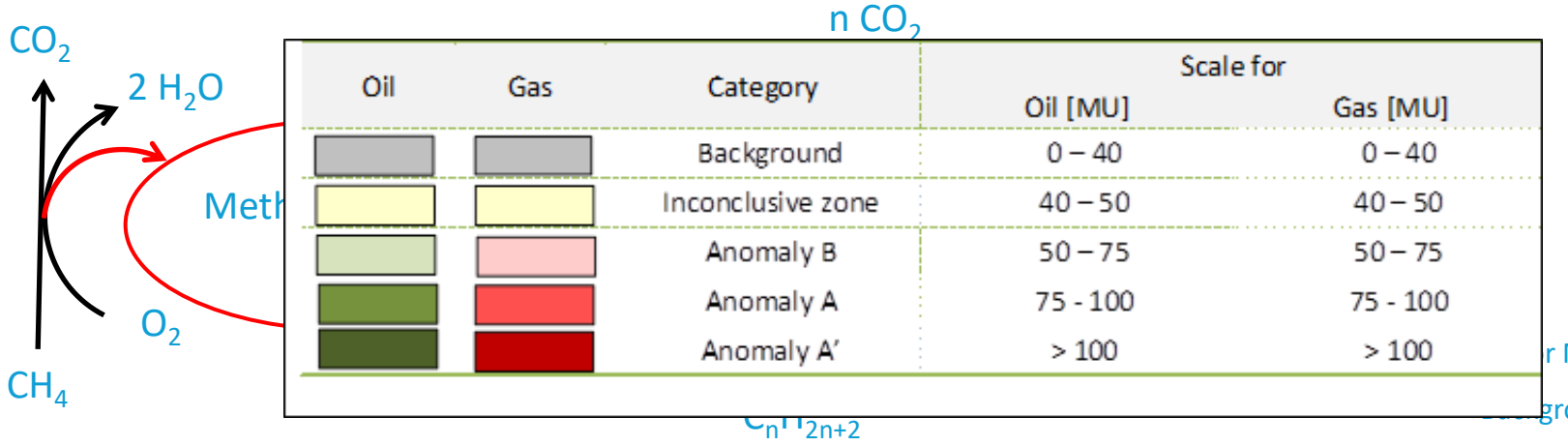
Gas extraction OSG Weighing/Milling/Drying

Analysis GC-FID / IRMS

Basics of Microbial Prospecting

Significantly increased cell count and biochemical activity of methane- and hydrocarbon-oxidizing bacteria: “Microbial Anomalies”

Separate biochemical pathways for methane and HCs allow differentiation between:



Oil	Gas	Category	Scale for Oil [MU]	Scale for Gas [MU]
		Background	0 – 40	0 – 40
		Inconclusive zone	40 – 50	40 – 50
		Anomaly B	50 – 75	50 – 75
		Anomaly A	75 - 100	75 - 100
		Anomaly A’	> 100	> 100

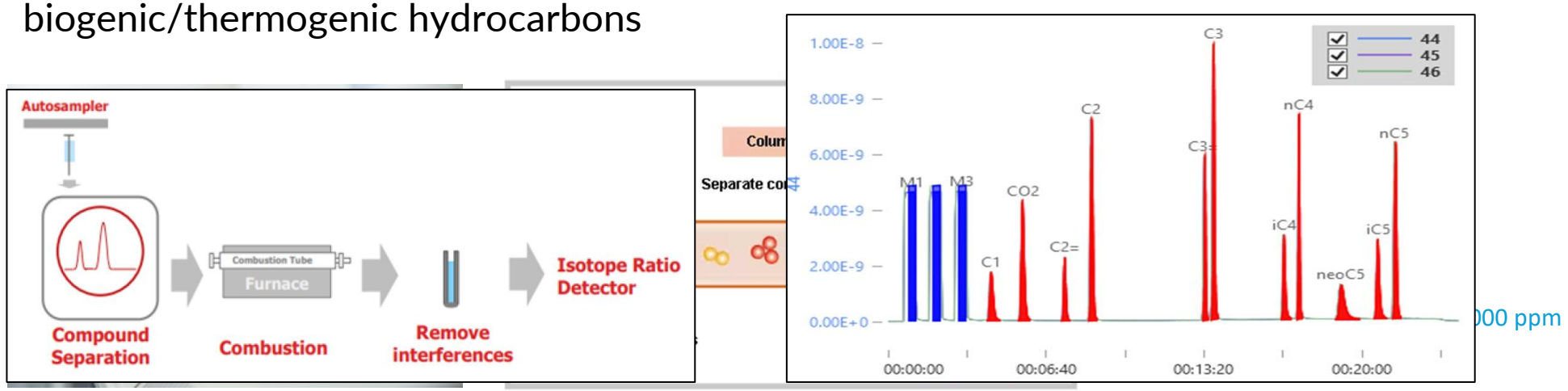
r Methane: 2 – 200 ppm

ground: ~ 1.7 ppm

Basics of Geochemical Prospecting

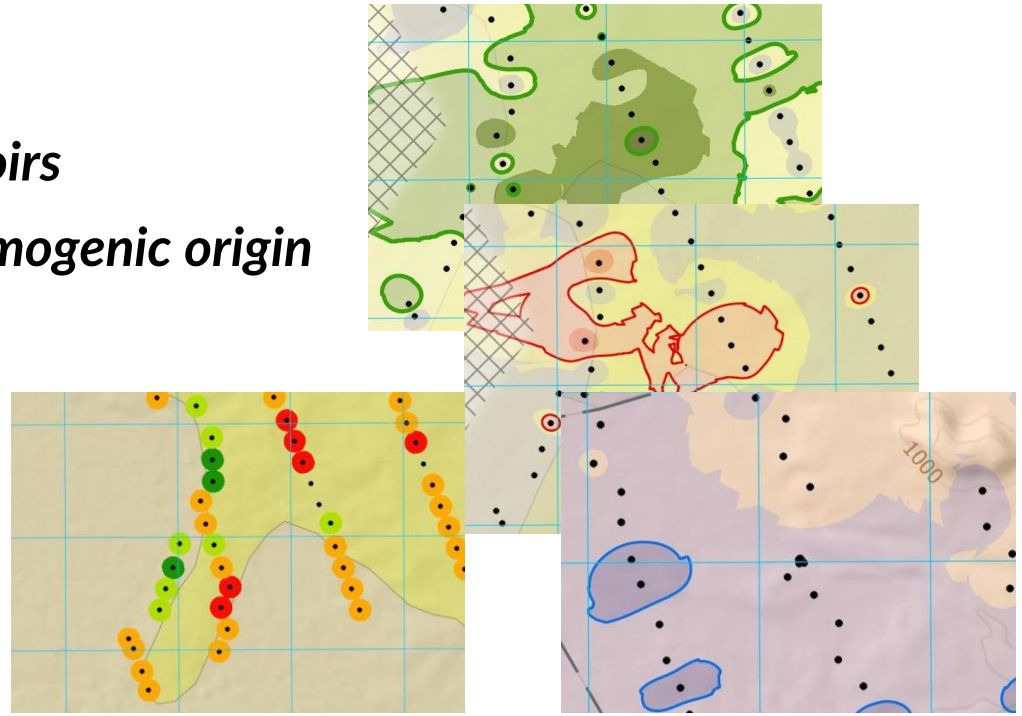
Significantly increased gas concentration and detectable shift of gas component ratios:
“Geochemical Anomalies” – “Wet/Dry Gas – Oil/Condensate”

Analysis of component-wise dC isotopes allows for differentiation between biogenic/thermogenic hydrocarbons



Added value of microbial/chemical surface exploration

- *Reduce the risk of drilling dry holes*
- *Differentiation between oil and gas reservoirs*
- *Differentiation between biogenic and thermogenic origin*
- *Applicable offshore and onshore*
- *Simple and rapid sampling procedure*
- *Environmentally friendly*
- *Successful worldwide*



Thank you

Stand E20

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