## VON DER TIEFSEE BIS ZUR ATMOSPHÄRE

Von der Idee zum Produkt:
Digitale Video- und Datentelemetrie für Koaxialkabel auf Forschungsschiffen

Peter Linke

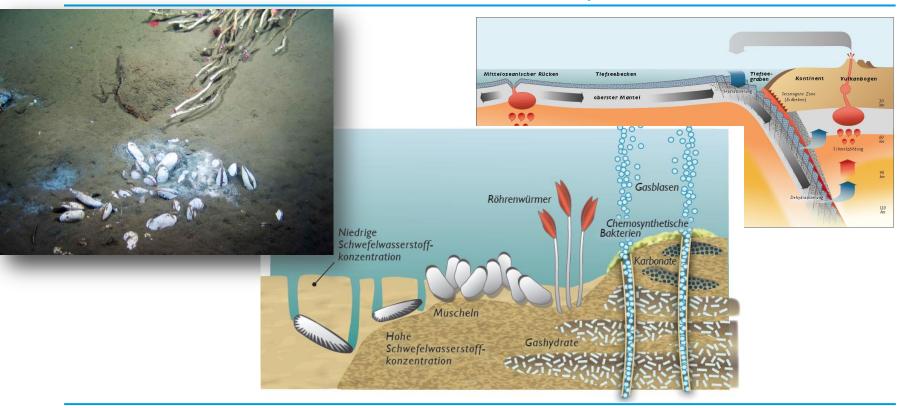






# Einführung: Plattentektonik, Subduktionszonen, Methanquellen

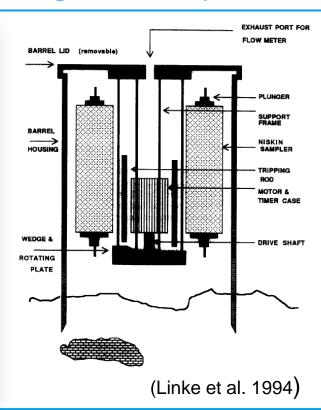






### Herausforderung: Beprobung von Punktquellen







A125/12 (1990)



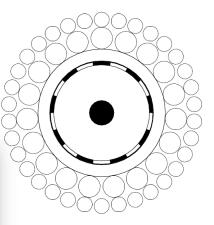
## Herausforderung: Beprobung von Punktquellen



SO78 (1992)







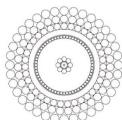
18,2 mm Koaxialkabel



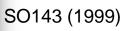
## Herausforderung: Beprobung von Punktquellen







18,2 mm Glasfaser-Hybridkabel



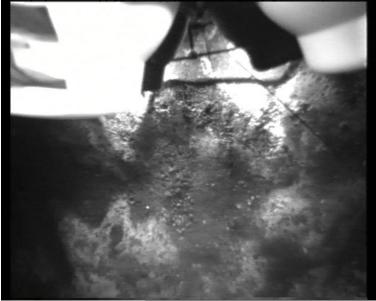




## Video-geführter Einsatz von Landern



(Pfannkuche & Linke 2003)





#### Problem: Schiffe mit Koaxialkabeln

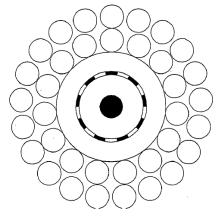
DSL (digital subscriber line)
Technologie mit MPEG-4 Encodierung

Problem der gleichzeitigen Stromund Datenübertragung

Rohleder, M. (2006) "Entwicklung und Erprobung eines Systems zur digitalen Übertragung von Video- und Messdaten zwischen Forschungsschiffen und Unterwassergeräten über extrem lange Koaxialkabel" Diplomarbeit FH Kiel







Coaxial Cable RR 11 mm / 1.0 mm<sup>2</sup>

#### Electrical / Optical Characteristics:

Element	Characteristic	Unit	Value
Coax core	DC conductor resistance	Ω/km	≤ 19.5
	Insulations resistance; Core against Screen, Earth Insulations resistance; Screen against Armouring, Earth	GΩ∙km GΩ∙km	≥ 100 ≥ 1
	Capacitance at 800 Hz*	nF/km	130
	Test voltage, DC, 2 min	kV	8



#### Überwassereinheit



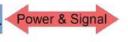




Power Supply+Display Power 110-240V AC Connector 110-240V AC Power 0-600V DC Supply Signal/Power Ethernet MODEM Ethernet Coupling Connector Sea cable μC Connector

Modem Status + Parameter Display

- Input power supply 85 265Vac
- Sea cable output 365Vdc up to 500W
- optional adjustable up to 600 Vdc (1,2kW max.)
- Network interface LAN/Ethernet RJ45



(Linke et al. 2015)

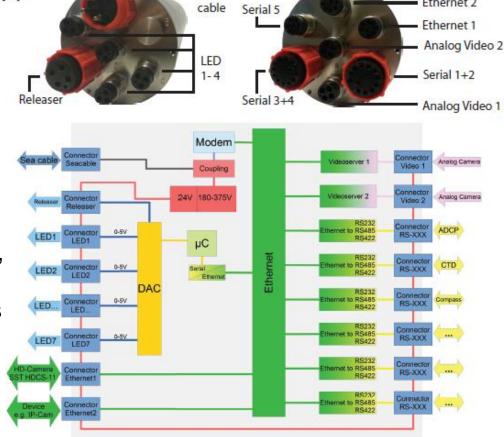


#### Unterwassereinheit



- Input voltage range: 180 375Vdc
- Standard output voltage: 24V
- Output power max.: 250 Watt 6 bidirectional ports: 3\*RS232+422, max. baud rate: 921.6k LAN/Ethernet for video applications (e.g. IP cameras)

(Linke et al. 2015)



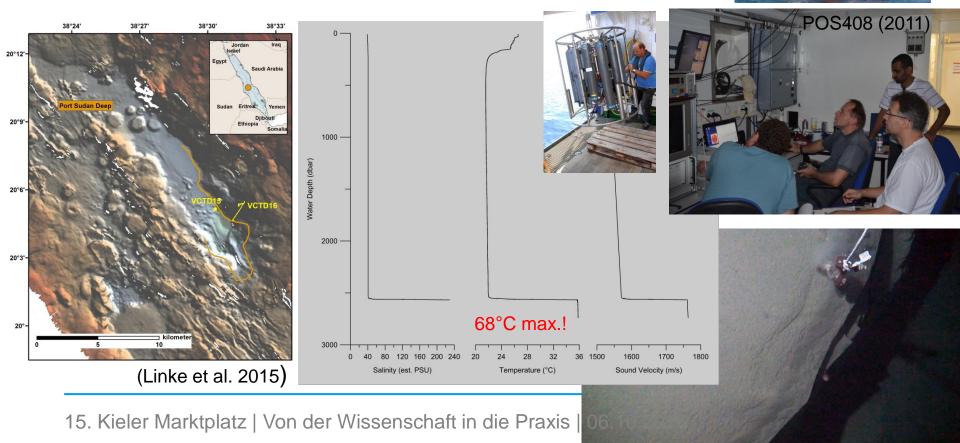
Sea



Ethernet 2

(b)

#### Ersteinsatz in heißen Salzlaken im Roten Meer





## Video- Übertragung und Geräte-Steuerung



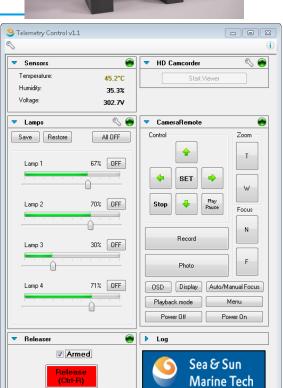
Online streamed, compressed 785 x 575 pixel)





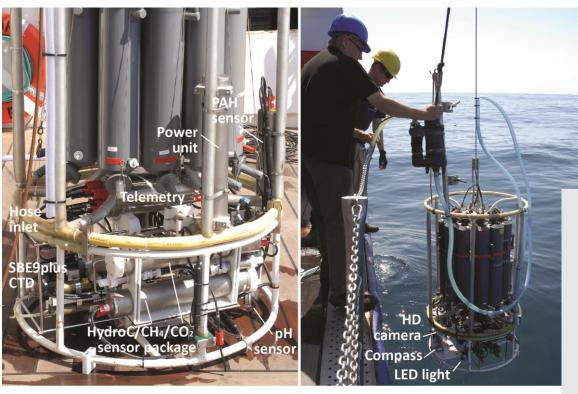
Recorded full HD: 1920 x 1080 pixel

(Linke et al. 2015)



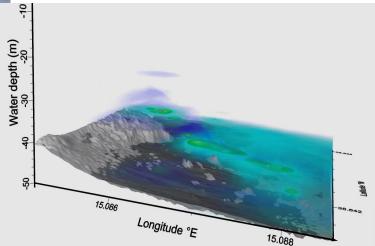


## Einsatz an CO<sub>2</sub>-Quellen im Mittelmeer



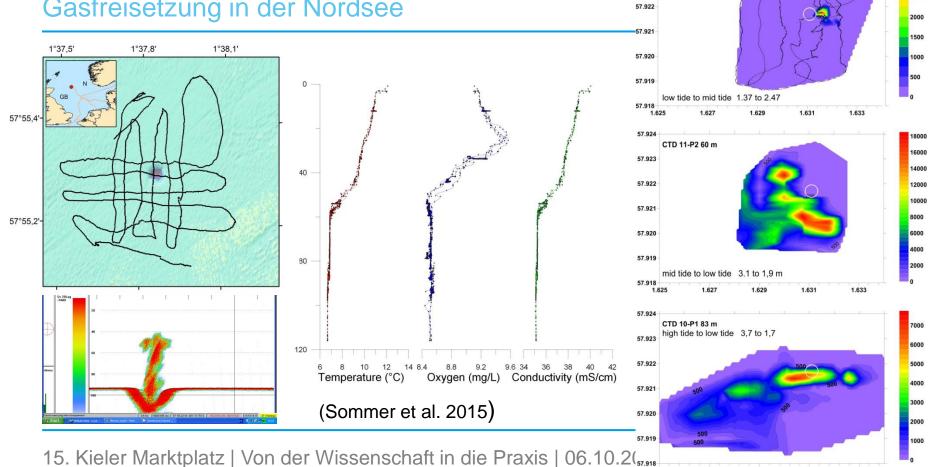


(Schmidt et al. 2015)



15. Kieler Marktplatz | Von der Wissenschaft in die Praxis

## Gasfreisetzung in der Nordsee



CTD 12 10 m

1.627

1.629

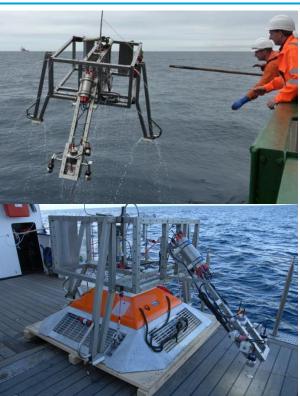
1.631

1.633

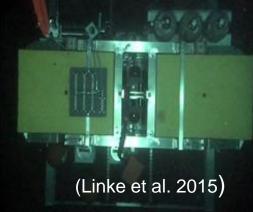
57.923

## Video-geführtes Absetzen von Landern





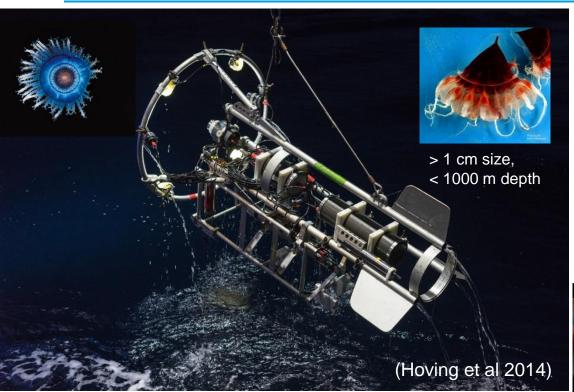




15. Kieler Marktplatz | Von der Wissenschaft in die Praxis | 06.10.2016

# PELAGIOS Pelagic In Situ Observation System





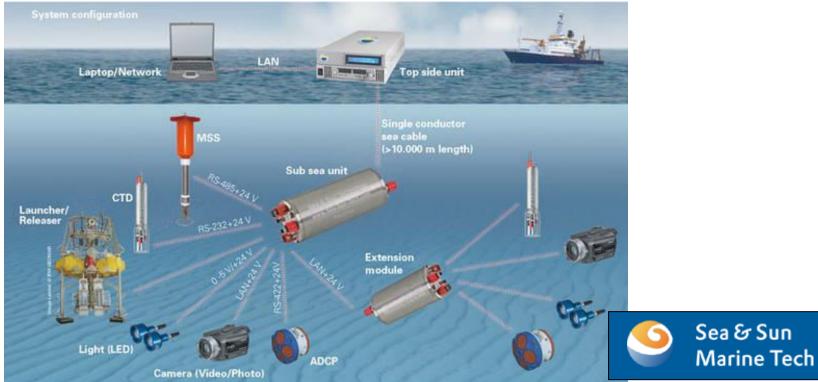
- Towed pelagic camera system
- HD camera (1CamAlpha SubC)
- CTD (SBE 19 SEACAT)
- Optode (SBE 63)
- Telemetry (SD6-SST)
- Batteries (2 x 32Ah) 10 h
- LED arrays
- Aluminium frame, depressor
- Max. visibility 3 m from camera
- 80° FoV



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#### Universeller Einsatz







**GEMEINSCHAFT** 



## Vielen Dank!

### Referenzen:

Hoving, H.J.T., Fabrizius, E., Körtzinger, A., Linke, P., Mees, S., Piatkowski, U. (2014) Development of a pelagic oceanic biological and environmental observation system. Marine Imaging Workshop, Southampton, 7 – 10. April 2014, NOC, Southampton, UK.

Linke, P., Schmidt, M., Rohleder, M., Al-Barakati, A., Al-Farawati, R. (2015) Novel online digital video and high-speed data broadcasting via standard coaxial cable onboard marine operating vessels. Marine Technology Society Journal 49(1), 7-18.

Schmidt, M., Linke, P., Sommer, S., Esser D., Cherednichenko, S. (2015) Natural CO<sub>2</sub> seeps offshore Panarea: A test site for subsea CO<sub>2</sub> leak detection technology. Marine Technology Society Journal 49(1), 19-30.

Sommer, S., Schmidt, M. and Linke, P. (2015) Continuous inline mapping of a dissolved methane plume at a blowout site in the Central North Sea UK using a membrane inlet mass spectrometer – Water column stratification impedes immediate methane release into the atmospere. Marine and Petroleum Geology, 68. pp. 766-775.