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Electromagnetic experiments for the detection and characterization of seafloor massive sulfides: two case studies from the Mediterranean and Northern Mid-Atlantic Ridge

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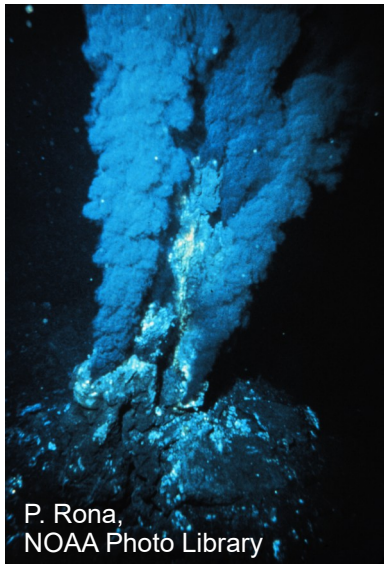
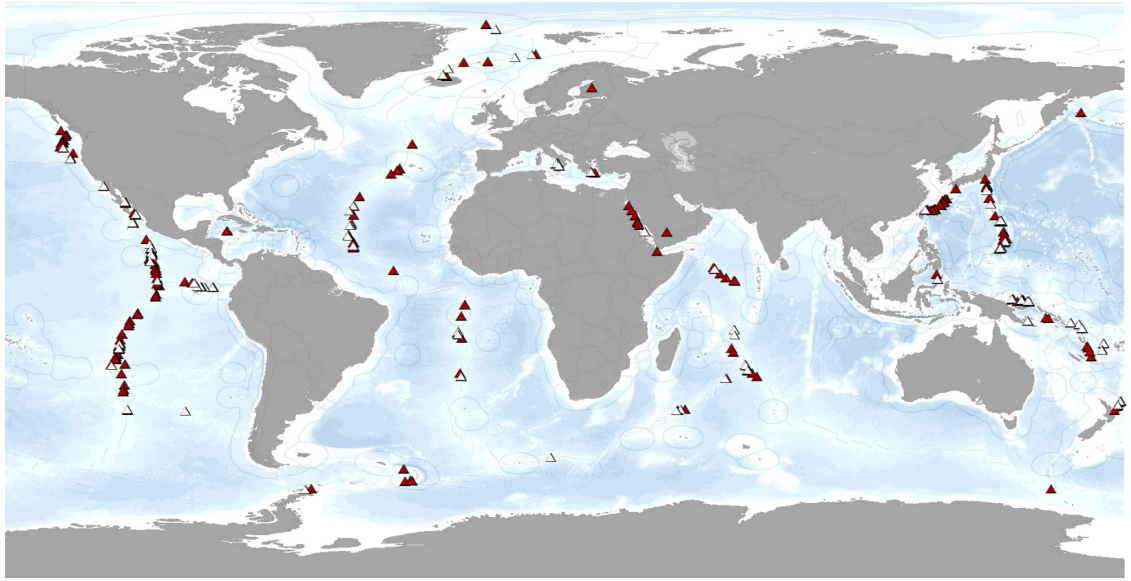
Motivation

- Detection & characterization of seafloor massive sulfides (SMS) with electromagnetic methods
- EM methods do not rely on hydrothermal activity or chemical tracers
- Generally, inductive EM methods can detect conductive units under resistors

  → Suitable to detect extinct and covered SMS systems in marine environment ???





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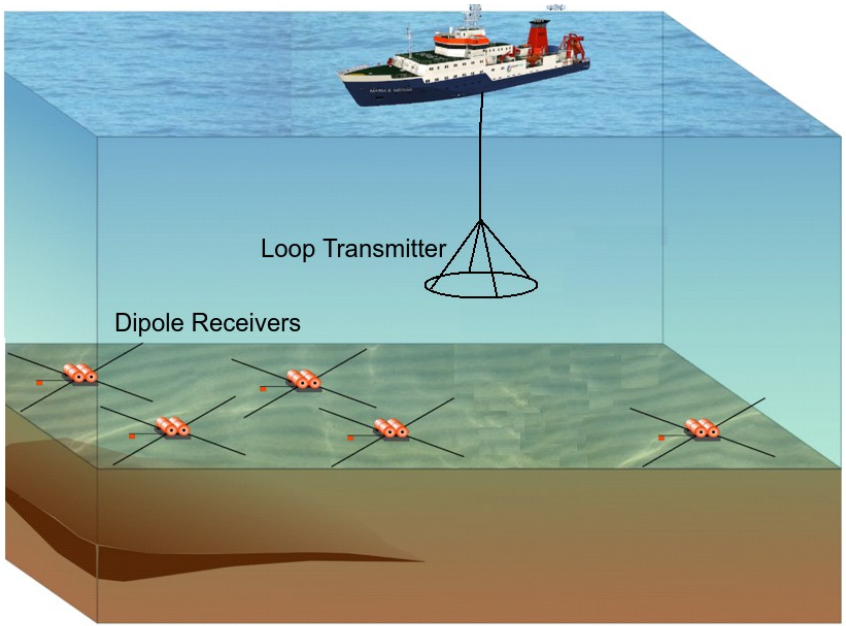
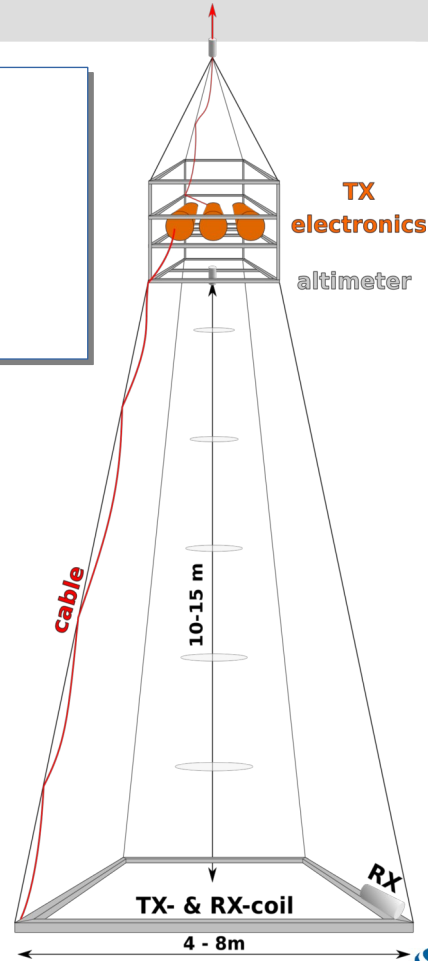
Two Types of EM Experiments

- TEM experiment with coincident loop system *MARTEMIS* (DOI ~30m, right)
- Coil2Dipole experiment with MARTEMIS source and stationary OBEM receivers (DOI ~100m, bottom)





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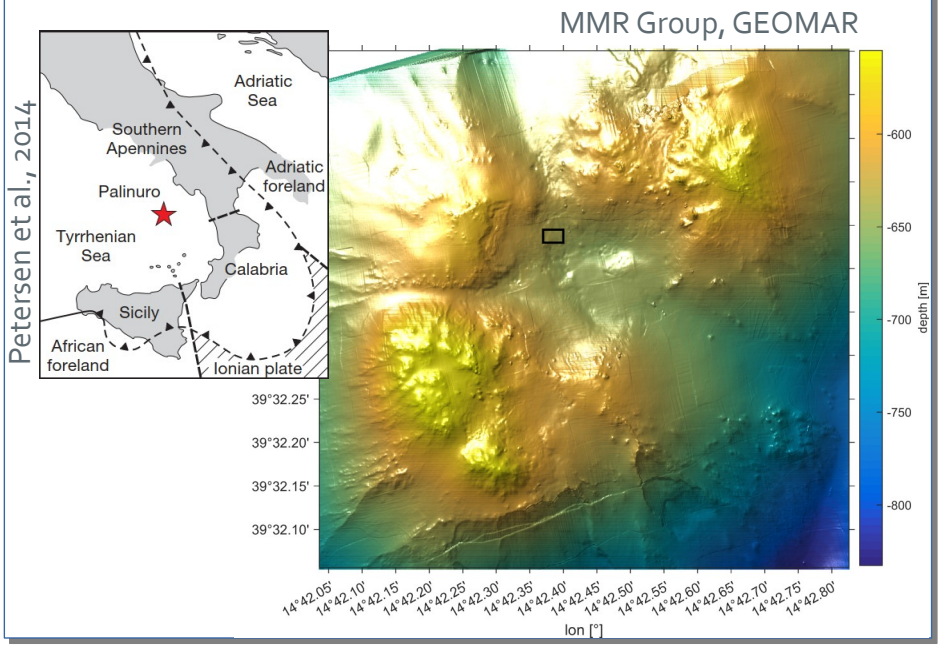
Two Working Areas / Targets

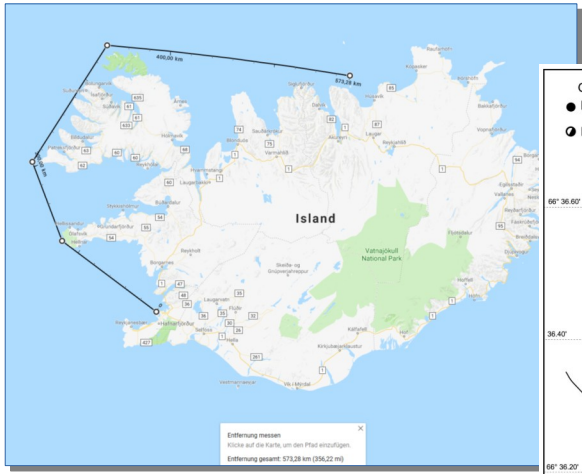
Palinuro (Mediterranean)

- Inactive site (<50°C)
- SMS under sedimentary cover

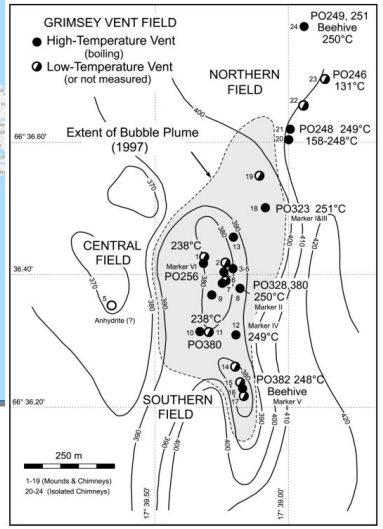


Grimsey Vent Field (Iceland)

- Hydrothermal site (~280°C)
- sediment hosted, no SMS found



Hannington et al., 2001



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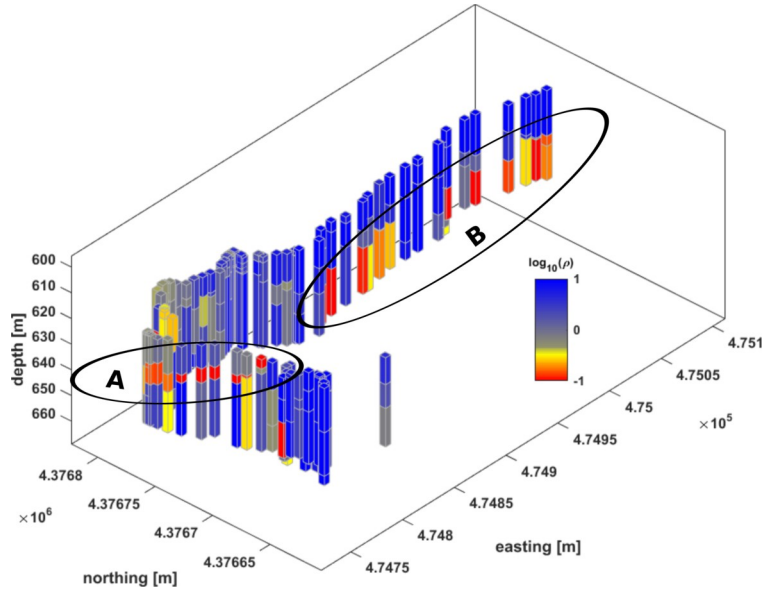
Exemplary Results TEM

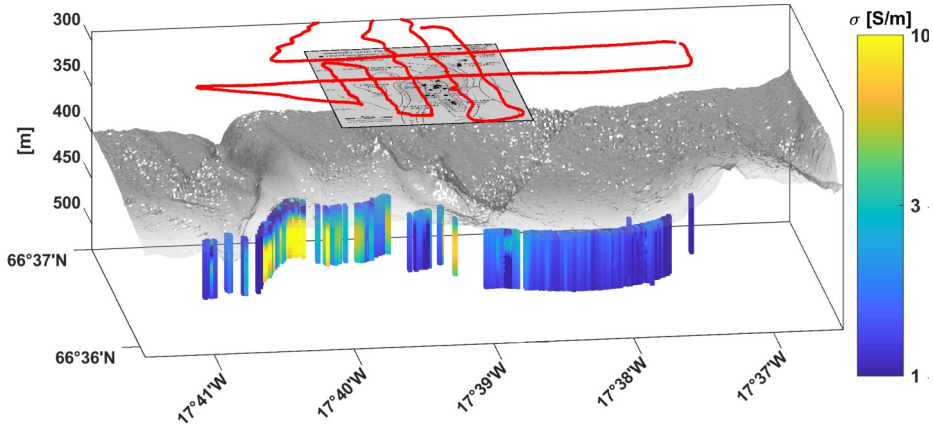
Palinuro (Mediterranean)

- 1st experiment with *MARTEMIS*
- Conductor (A) at drilled SMS site



Grimsey Vent Field (Iceland)

- TEM along main profile
- Conductor west of hydrothermal site



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Conclusions

- Several conductors – likely related to SMS – have been identified in experiments.
- Inductive EM methods are suitable for detection and characterization of SMS !!!
- Evaluation of Coil2Dipole data is work in progress …

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