Comingled seafloor pockmarks and micro-depressions offshore Big Sur, California

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Prior to 2017 the offshore area of Central California was poorly mapped and explored.

Requests for lease sales to develop floating offshore wind farms has now focused research efforts in this area.
Big Sur Pockmark Field

- 790 m – 1200 m water depth
- ~5200 pockmarks counted
- Covers a ~1300 km² area

Possible wind farm development areas

Area Now Systematically Mapped

2m contours
Origin of Pockmarks?

Gas driven formation model
- Predicts unstable seafloor
- Venting methane supports specialized biological communities
20 AUV mapping surveys starting in 2018 grids revealed comingled micro-depressions in amongst the pockmarks.

Surface Ship
- e.g., 1 km water depth
- 10 m lateral resolution

Autonomous Underwater Vehicle
- 1 m lateral resolution bathymetry
- ‘Road Maps’ for Remotely Operated Vehicle observation and sampling
Pockmarks
~175 m across
~5 m deep
Micro-depressions
~10 m across
~1 m deep
Steeper sides

Large Pockmark

Water Depth 937 – 953 m

Micro-depressions w/ tails

Water Depth 938.5 – 942.5 m

Depth (m)

50 m

25 m
Pockmarks

- Pockmarks persist for 20 – 50 m
- Fill in and re-emerge
- Migrate Laterally

Micro-depressions

Surface features

$\sim 4.6 \times VE$
• 30 ROV dives in the region
• 14 pockmarks and 36 micro-depressions
• Sediment cores collected and porewaters analyzed
Micro-depressions

- Rocks
- Trash
- Fish
- Plastic Bags
- Fishing Gear
Looking for evidence of Methane

Porewaters and ROV observations

- No significant methane flux
- No gas upflow or exotic fluid observed
- No authigenic carbonates
- No chemosynthetic biological communities
Summary

No evidence of methane venting
No specialized biological communities
Basic characterization of wind farm areas

Micro-depressions
- Previously undetected
- Not incipient pockmarks
- Recently eroded features
- Providing habitat and collecting debris

Pockmarks
- No significant modification in >50,000 years
- Persisted for over 400,000 years
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