Supplementary Information

Thermophilic anaerobic oxidation of methane by marine microbial consortia

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Supplementary Information includes

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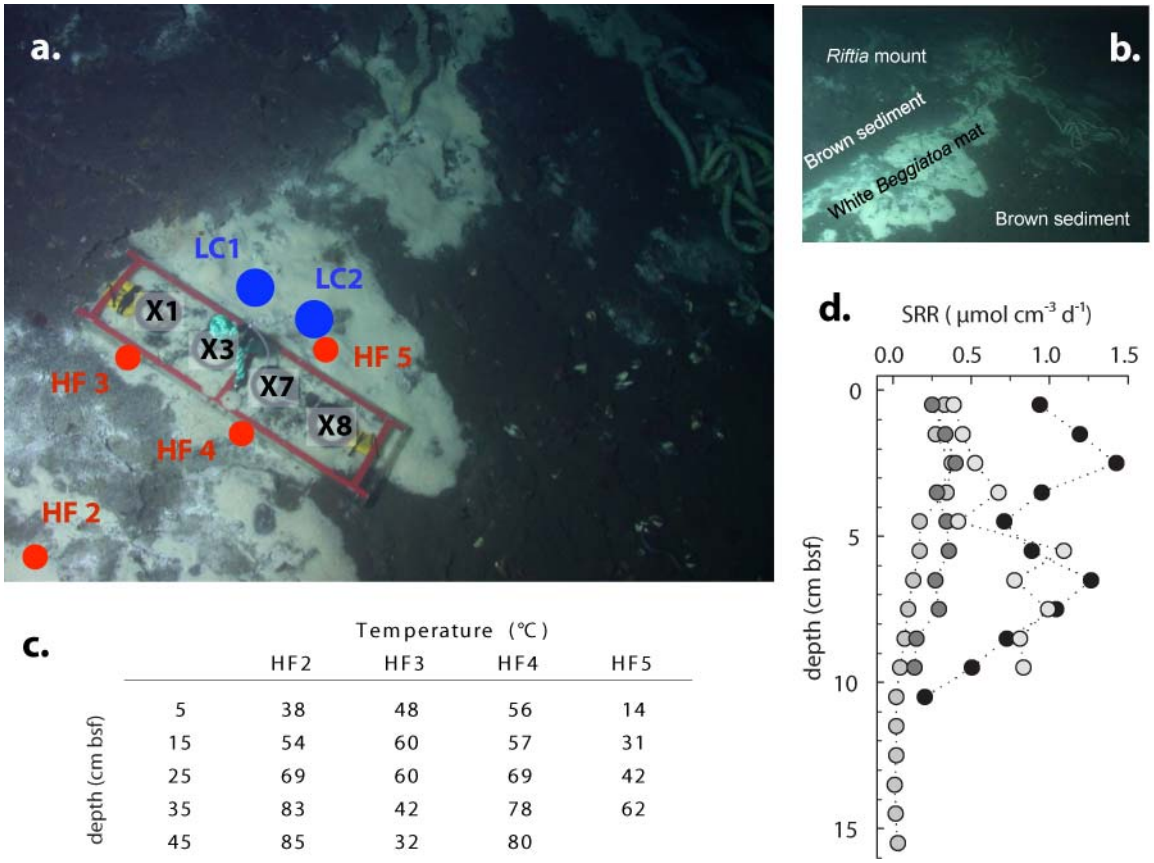
Supplementary Table 1 *In vitro* studies of AOM and apparent temperature ranges (modified from Boetius *et al.*, 2009).

Sampling site	*Dominating ANME[a] population*	*In situ temperature (°C)*	*In vitro temperature optimum of AOM (°C)*	*Reference*
Haakon Mosby Mud Volcano (North Atlantic)	ANME-3/DBB[b]	–1.5	4–8	Krüger *et al.*, 2005
Hydrate Ridge (East Pacific)	ANME-2/DSS[c]	4	10–15	Nauhaus *et al.*, 2005
Monterey Basin (East Pacific)	ANME-2/DSS	4	5	Girguis *et al.*, 2003
Gulf of Mexico	ANME-2/DSS	6	16–20	Krüger *et al.*, 2005
Black Sea	ANME-1/DSS ANME-2/DSS	8	16–25	Nauhaus *et al.*, 2005, Deusner *et al.*, 2010
Amon/Isis Mud Volcano (Eastern Mediterranean)	ANME-2/DSS	14	20	Holler *et al.*, 2009, Schreiber *et al.*, 2010
Eckernförde Bay (Baltic Sea)	ANME-2/DSS	5–20	20	Krüger *et al.*, 2005, Treude *et al.*, 2005, Jagersma *et al.*, 2009, Meulepas *et al.*, 2009
Kattegat (Baltic Sea)	ANME-2/DSS, DBB	5–20	20–25	Krüger *et al.*, 2005

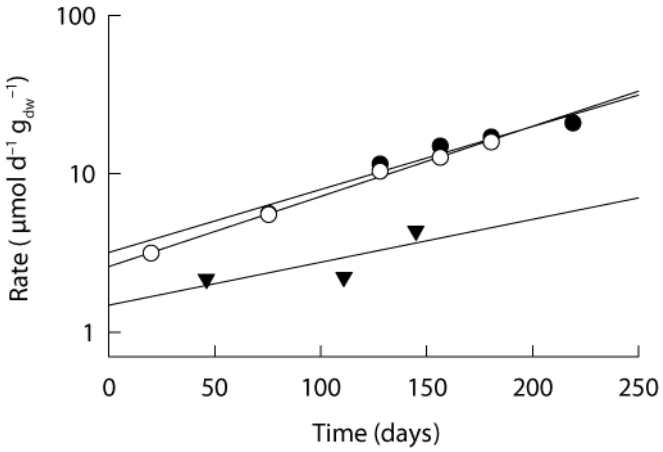
[a] ANME, clusters of anaerobic methanotrophs (Euryarchaeota)
[b] DBB, *Desulfobulbus*
[c] DSS, *Desulfosarcina/Desulfococcus*



c.

depth (cm bsf)	Temperature (°C) HF2	HF3	HF4	HF5
5	38	48	56	14
15	54	60	57	31
25	69	60	69	42
35	83	42	78	62
45	85	32	80	

Supplementary Figure 1 Images and data from sampling site. **(a)** Placement of long cores (LC1, 2), incubation cores (X1, X3, X7 and X8), and temperatures loggers (HF2, HF3, HF4, HF5) on *Beggiatoa*-covered sediment in Guaymas Basin (*ALVIN* Dive 4570). **(b)** Contextual information of the sampling site. **(c)** Temperature profiles from the sampling site. **(d)** Sulfate reduction rates derived from *in vivo* radiotracer incubations.



Supplementary Figure 2 Semi-logarithmic plot of sulfide production in methane-amended sediment slurries incubated at 37 °C (open circle), 50 °C (filled circles) and 60 °C (triangles) yielding doubling times of 77, 68 and 112 days for the 37 °C, 50 °C and 60 °C enrichments, respectively.

Supplementary Table 2 Oligonucleotide probes used for fluorescence *in situ* hybridization.

Probe	*Specificity*	*Probe sequence (5´-3´)*	*Target site*[a]	*FA*[b] *[%]*	*Reference*
NON338	Background control	ACTCCTACGGGAGGCAGC	338–355	10	Wallner *et al.*, 1993
EUB338 I-III	most *Bacteria*	GCTGCCTCCCGTAGGAGT GCAGCCACCCGTAGGTGT GCTGCCACCCGTAGGTGT	338–355	35	Daims *et al.*, 1999
Arch915	most *Archaea*	GTGCTCCCCCGCCAATTCCT	915–935	35	Stahl & Amann 1991
DSS658	*Desulfosarcina* spp./ *Desulfococcus* spp. and relatives	TCCACTTCCCTCTCCCAT	658–685	50	Manz *et al.*, 1998
ANME1-350	ANME-1 archaea	AGTTTTCGCGCCTGATGC	350–367	40	Boetius *et al.*, 2000
ANME-1-GI812	ANME-1 subgroup Guaymas I	CTGGCCCACATCGTTTAC	812–829	30	This study
cANME-1-GI812[c]	competitor oligonucleotide targeting Guaymas I cluster	CTAGCCCGCATCGTTTAC	812–829	30	This study
ANME-1-GII186	ANME-1 subgroup Guaymas II	GGACATCCTGCATTCCAG	186–203	10	This study
ANME-2-538	ANME-2 archaea	GGCTACCACTCGGGCCGC	538–555	50	Treude *et al.*, 2005
HotSeep-1-590	HotSeep-1 cluster of Deltaproteobacteria	ACACGCTCAACTTGCCTT	590–608	20–25	This study
HotSeep-1-H5	helper probes for HotSeep-1-590	CCCGCCTRCGCGCCCTTT	572–589	20–25	This study
HotSeep-1-H3		ARGTTGAGCCTCAGGCTT	608–625		This study
HotSeep-1-H3-3		GTTTTGAGCGCCATTCTG	626–643		This study
HotSeep-1-H3-3-3		CGGGACTCAAGAAAGGCA	644–661		This study

[a] Position in the 16S rRNA of *E.coli*
[b] FA: formamide concentration (vol/vol) in the hybridization buffer
[c] used as an unlabelled competitor oligonucleotide in hybridization with probe ANME-1-GI812 to limit cross-hybridizations with Guaymas II cluster

References Supplementary Information

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