

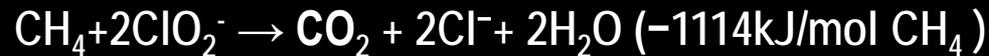
Cryptic Anaerobic Oxidation of Methane (CAMO):

Miller et al. 2014. Methane oxidation linked to chlorite dismutation.
Frontiers Microbiol. 5: 1 – 8.

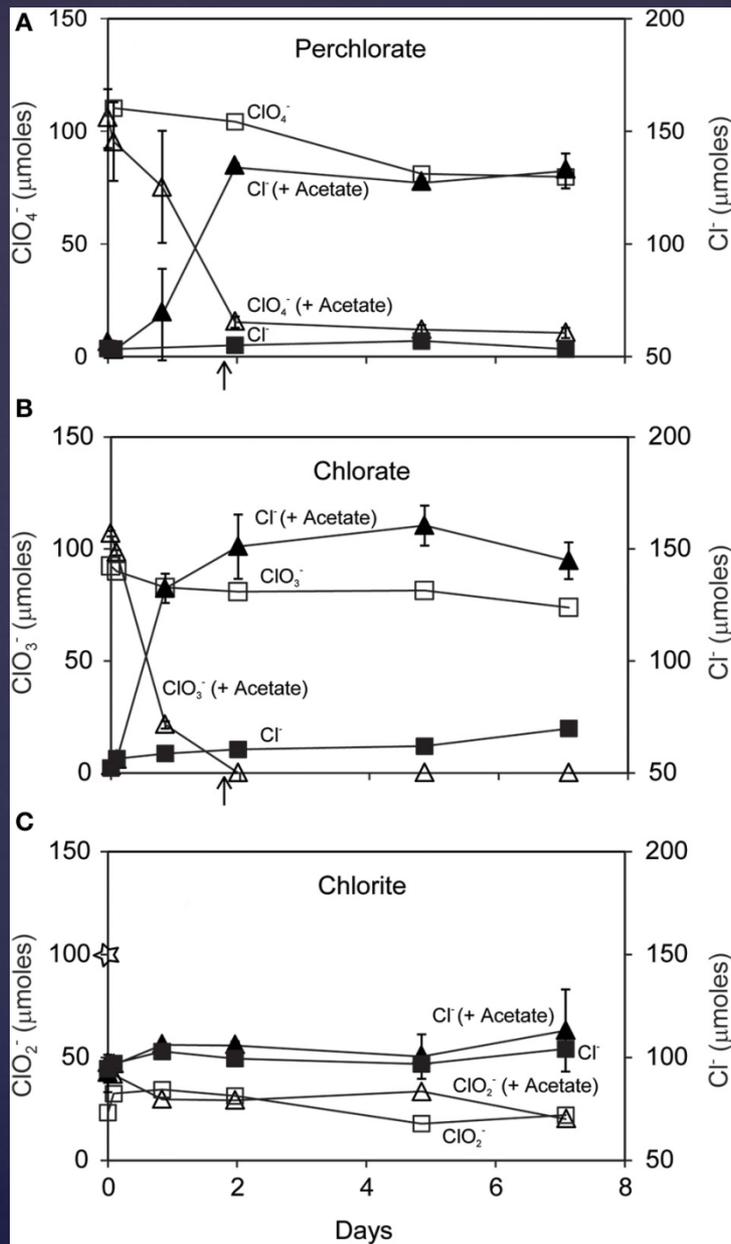
ClO_4^- and ClO_3^- could link to aerobic CH_4 oxidation by biochemical release of O_2 :



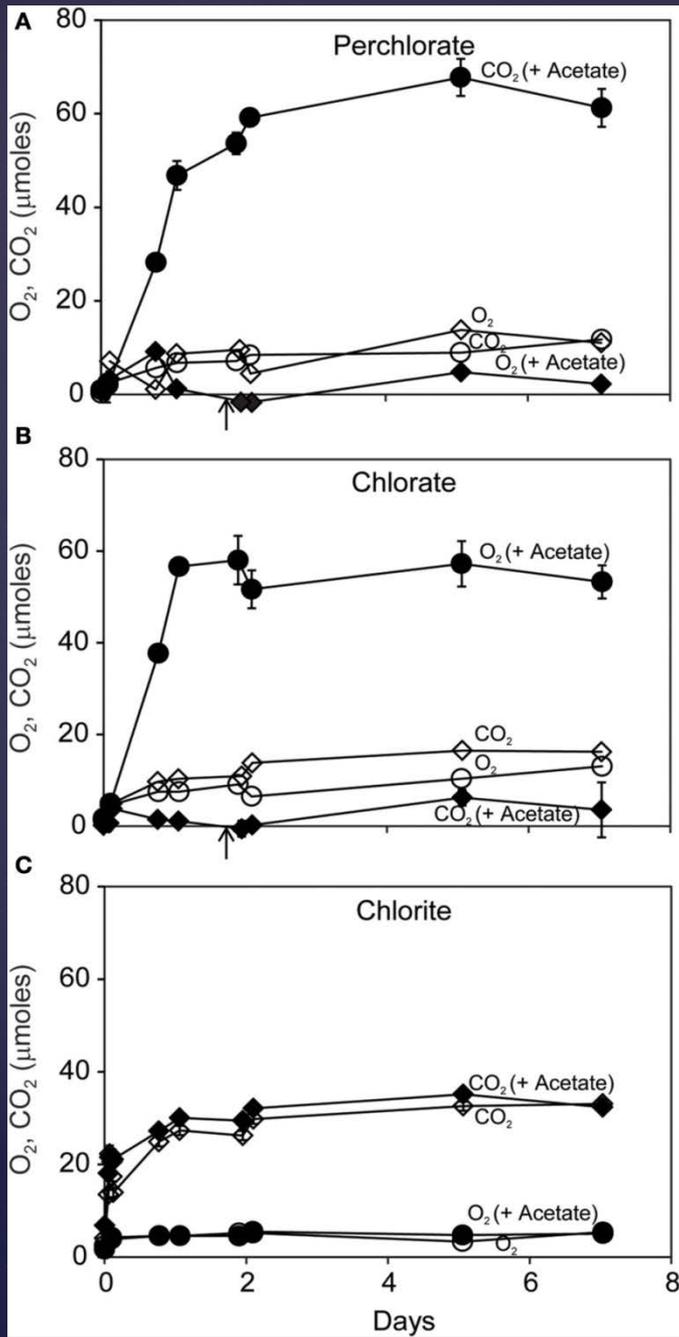
Net:



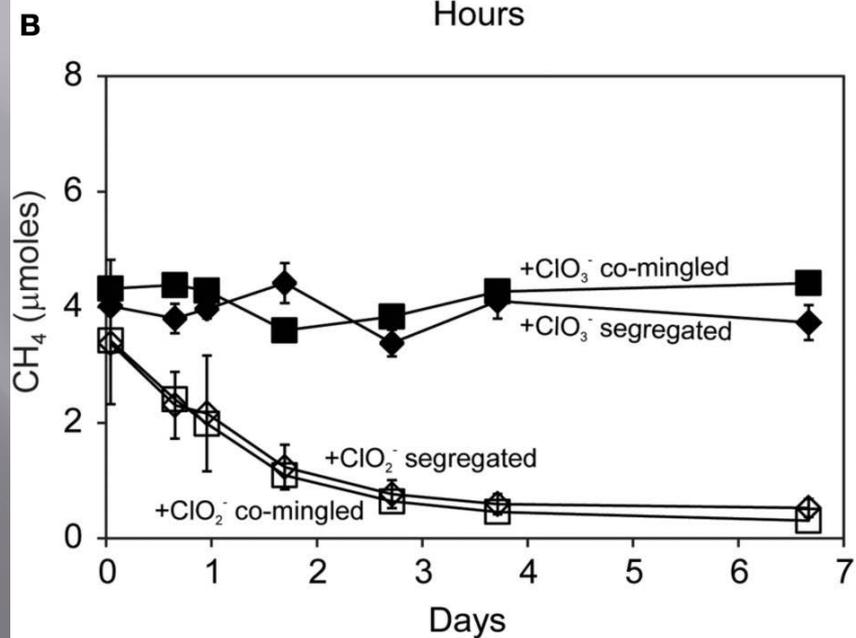
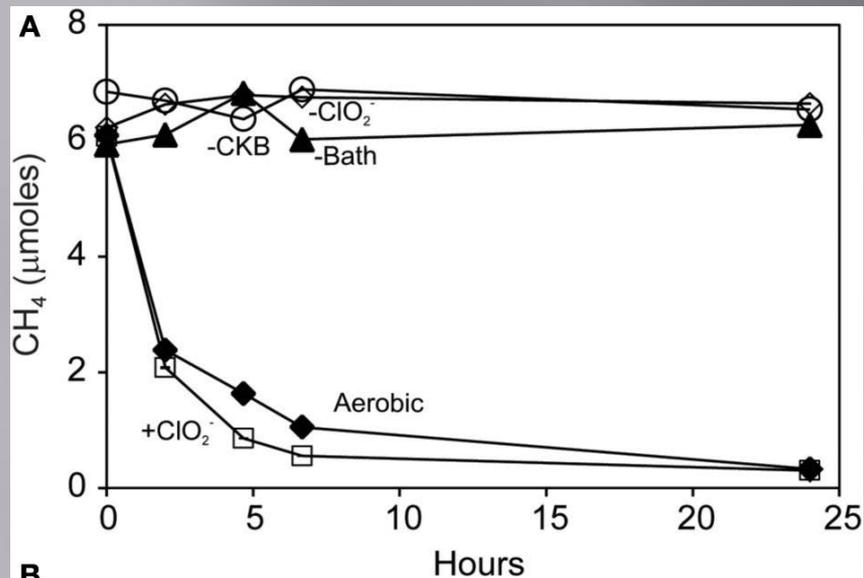
Ettwig et al. 2012. Nature. 464: 543 – 548. *Methylomirabilis oxyfera*



Time course of reaction of *D. agitata* CKB With 10mM perchlorate(A), chlorate (B), or chlorite (C) showing consumption of added substrate(open)and production of chloride (closed).

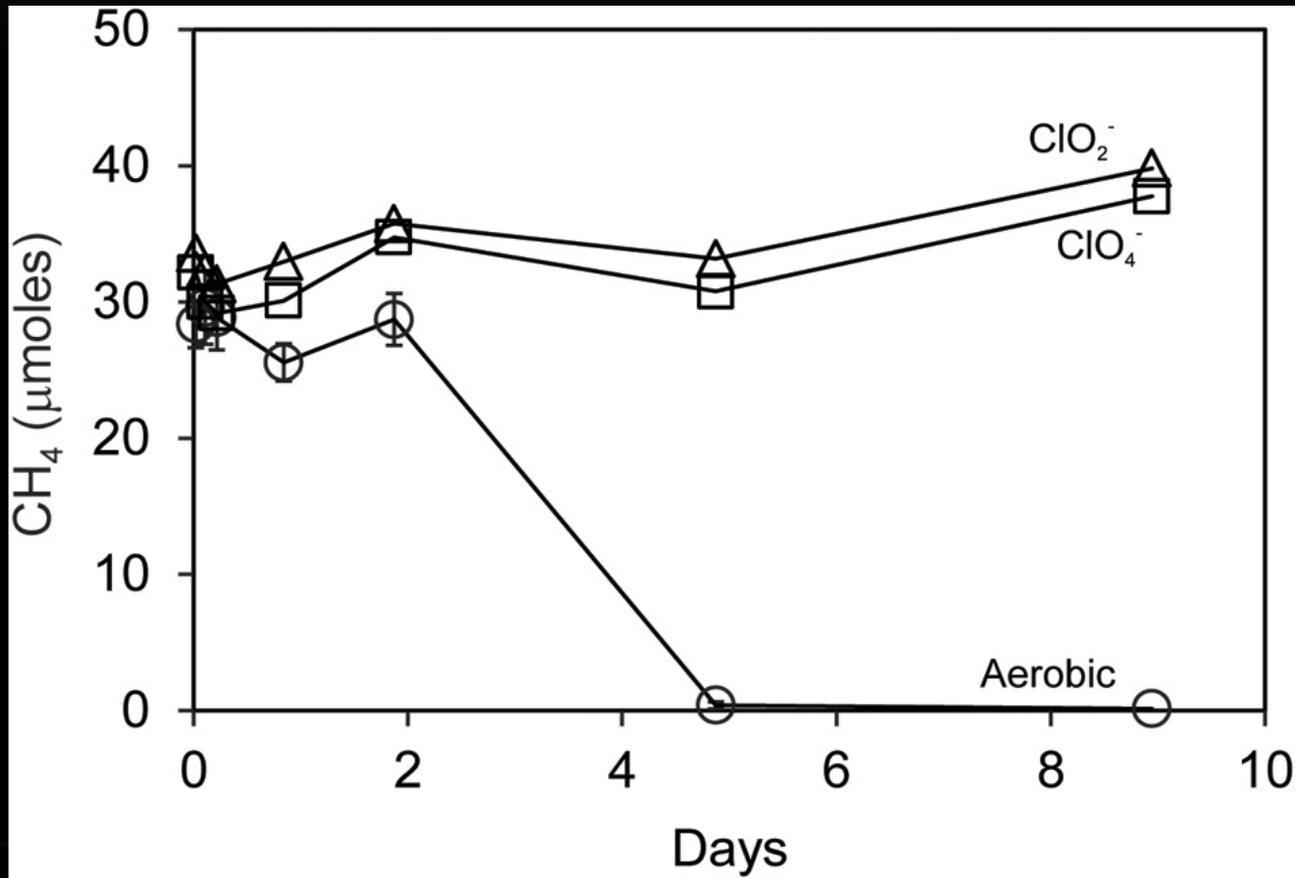


Time course of *D. agitata* CKB following addition of 10mM perchlorate (A), chlorate (B), or chlorite (C): Production of O₂ (diamonds) and CO₂ (circles), With (solid) or without (open) 5mM acetate

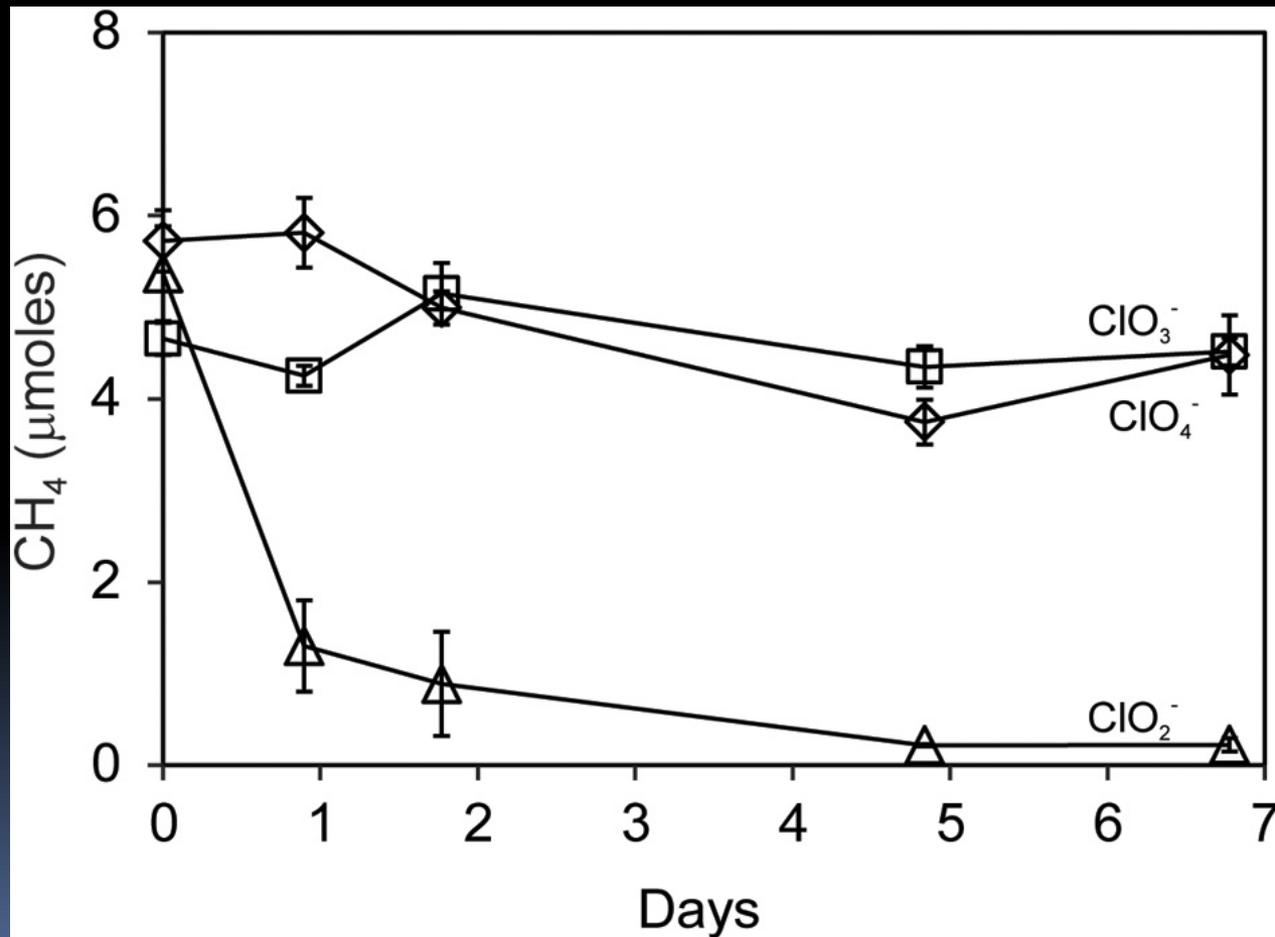


Methane uptake by mixed cultures of *D. agitata* CKB with *M. capsulatus* Bath (A) or *M. album* BG8 (B) During anaerobic or aerobic incubations. Cultures were co-mingled and provided with 5mM chlorite (open squares). Aerobic controls (solid diamonds).

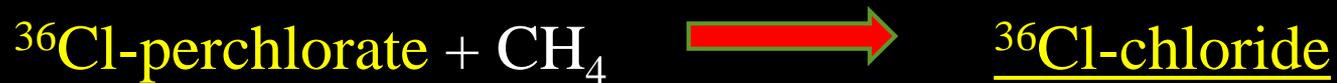
Methane uptake by Searsville Lake sediment slurries pre-adapted to reduce perchlorate with acetate.



Methane oxidation by Searsville Lake soils during anaerobic incubations with segregated *D.agitata* CKB following additions of perchlorate, chlorate, or chlorite.



Martian Radiotracer Experiments??



Chlorine-36 is an isotope of chlorine. Chlorine has two stable isotopes and one radioactive isotope: the cosmogenic isotope ^{36}Cl . Its half-life is **301,000 ± 2,000** years. ^{36}Cl decays primarily (98%) by beta-minus decay to ^{36}Ar , and the balance to ^{36}S .

Cost to make ^{36}Cl -perchlorate = **\$ 60,000**

for only **50 μCi** × 3 = **\$ 180,000**

HPLC-with in line flow-thru beta radiation

detector (Ramona) = ~ **\$ 100,000**

Radwaste disposal is **COSTLY**

Impractical!

Future Research Paths (more practical):

1. Experiments with *Methylomonas denitrificans* (L. Stein)
 2. Experiments with Mono Lake playas
 3. Experiments with Methyl chloride
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