Supplement of Biogeosciences, 20, 3625–3635, 2023
https://doi.org/10.5194/bg-20-3625-2023-supplement

Biogeosciences Open Access EGU

Supplement of

Fractionation of stable carbon isotopes during microbial propionate consumption in anoxic rice paddy soils

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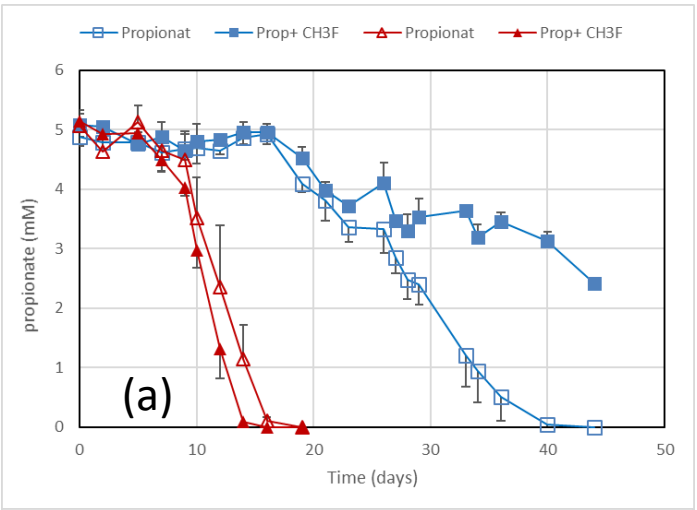
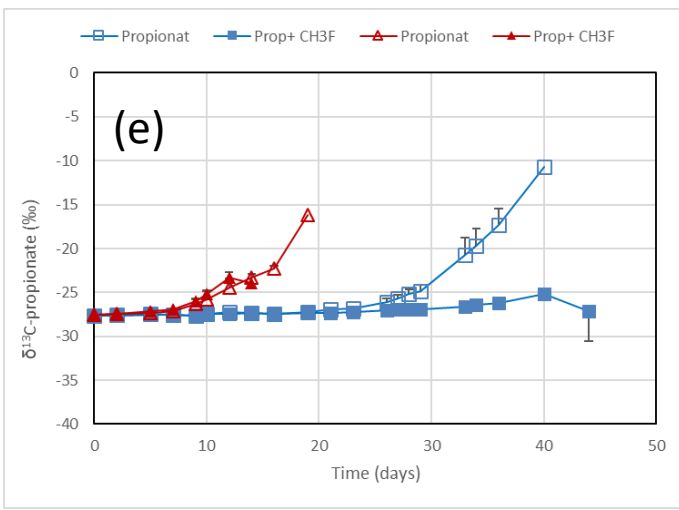
Legends of supplemental figures

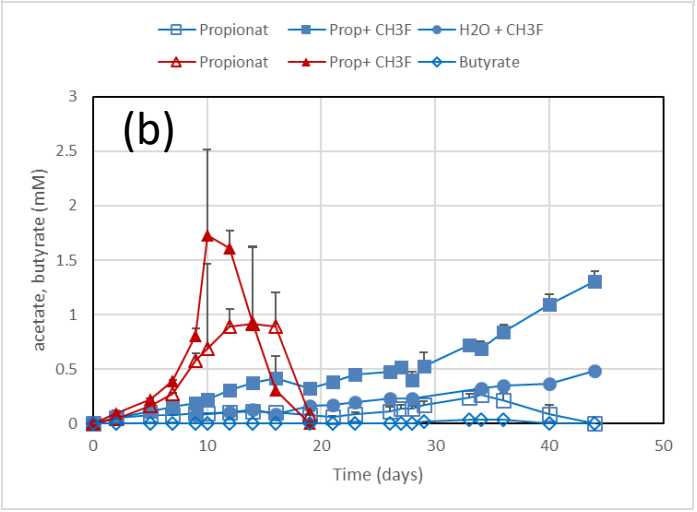
Fig. S1: Propionate conversion to acetate, butyrate, CH_4 and CO_2 in suspensions of paddy soil from the International Rice Research Institute (IRRI, The Philippines) after addition of propionate without sulfate (blue squares) or propionate plus sulfate (gypsum) (red triangles) without CH_3F (open symbols) or with CH_3F (closed symbols). Controls with addition of only water (blue or red circles) are only shown occasionally. The panels show the temporal change of (a) concentrations of propionate, (b) concentrations of acetate and butyrate (blue diamonds), (c) mixing ratios of CH_4 (1 ppmv = 10^{-6} bar), (d) mixing ratios of CO_2, (e) $\delta^{13}C$ of propionate, (f) $\delta^{13}C$ of acetate and butyrate, (g) $\delta^{13}C$ of CH_4, and (h) $\delta^{13}C$ of CO_2. Means ± SE.

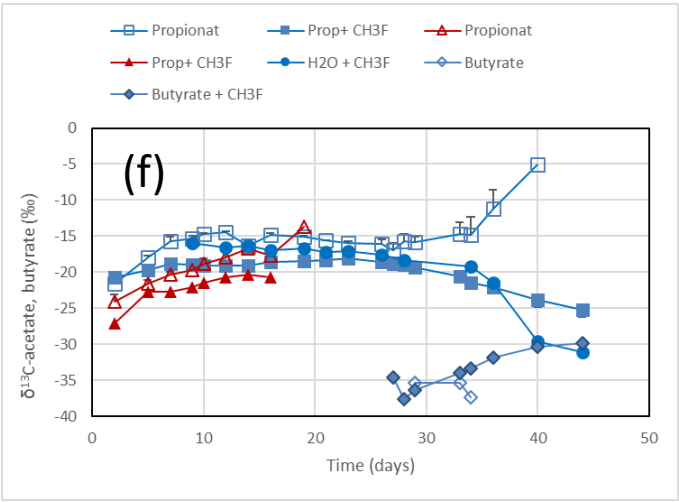
Fig. S2: Balance of (a, c) produced CH_4 and (b, d) produced acetate against the consumed propionate under (a, b) methanogenic and (c, d) sulfidogenic conditions in paddy soil from the IRRI (The Philippines). The open and closed symbols denote conditions in the absence and the presence of CH_3F, respectively. The black and red lines in panel (a) indicate aceticlastic methanogenesis by *Smithella* and *Syntrophobacter*, respectively. The black and red lines in panel (b and d) indicate transient acetate production by *Smithella* and *Syntrophobacter*, respectively. The different symbols indicate three different replicates.

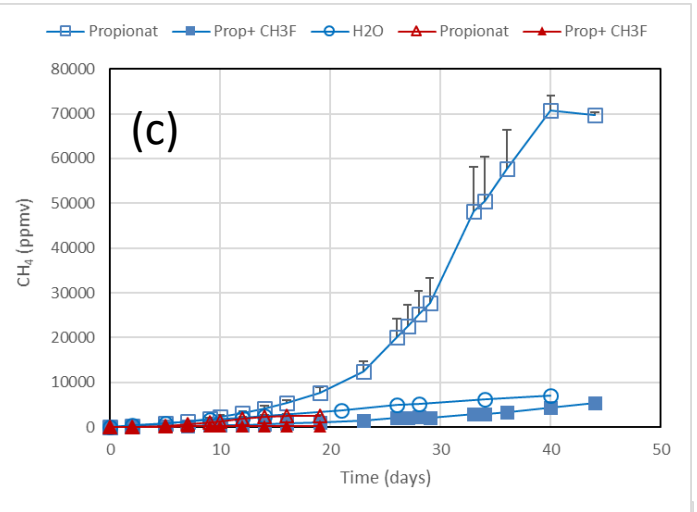
Fig. S3: Temporal change of the fraction of hydrogenotrophic methanogenesis (f_{H2}) in paddy soil from (a) Vercelli and (b) the IRRI. Data points are means ± SD of n = 3. Values of f_{H2} were computed using equation (3) and different values of $\varepsilon_{ac\text{-}methyl,CH4.}$ Data points are means ± SD of n = 3. The data points of f_{H2} in panels (a) and (b) were averaged over time for each $\varepsilon_{ac\text{-}methyl,CH4}$ and then averaged for each replicate (n = 3). The means ± SD are presented in panel (c).

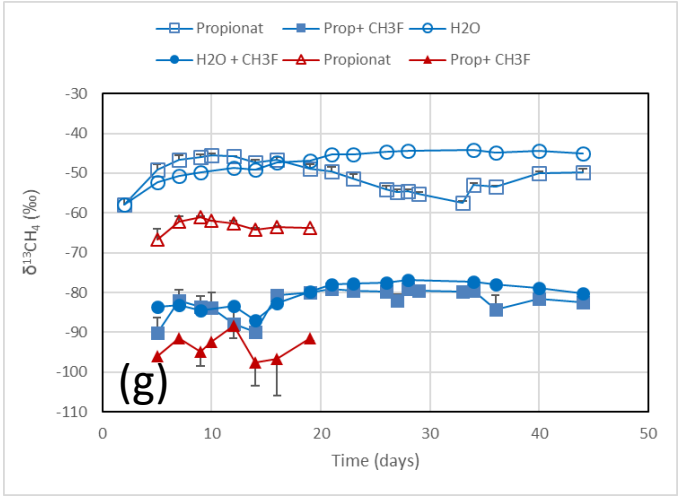

Propionat
Prop+ CH3F
Propionat
Prop+ CH3F
propionate (mM)
(a)
Time (days)

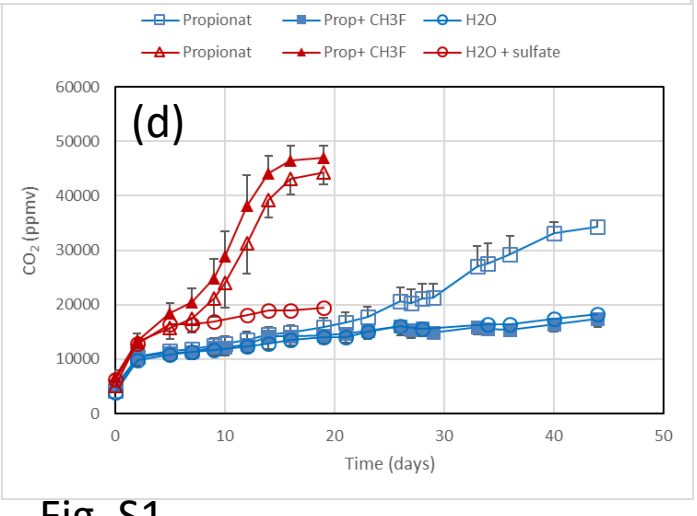

Propionat
Prop+ CH3F
Propionat
Prop+ CH3F
(e)
δ13C-propionate (‰)
Time (days)


Propionat
Prop+ CH3F
H2O + CH3F
Propionat
Prop+ CH3F
Butyrate
(b)
acetate, butyrate (mM)
Time (days)


Propionat
Prop+ CH3F
Propionat
Prop+ CH3F
H2O + CH3F
Butyrate
Butyrate + CH3F
(f)
δ13C-acetate, butyrate (‰)
Time (days)


Propionat
Prop+ CH3F
H2O
Propionat
Prop+ CH3F
(c)
CH4 (ppmv)
Time (days)


Propionat
Prop+ CH3F
H2O
H2O + CH3F
Propionat
Prop+ CH3F
(g)
δ13CH4 (‰)
Time (days)


Propionat
Prop+ CH3F
H2O
Propionat
Prop+ CH3F
H2O + sulfate
(d)
CO2 (ppmv)
Time (days)

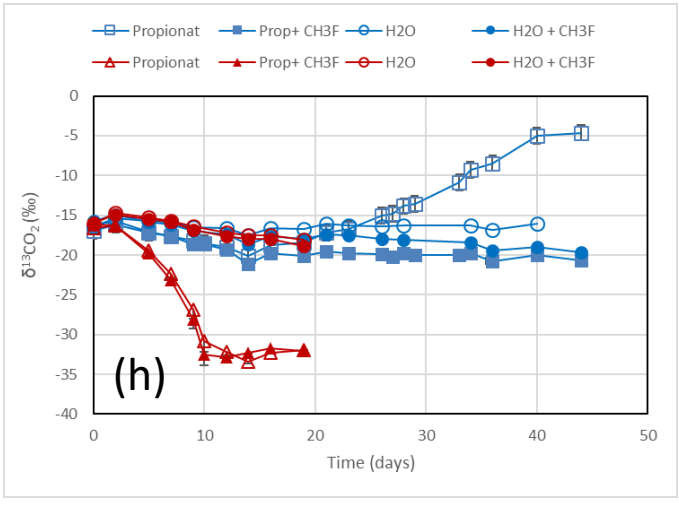
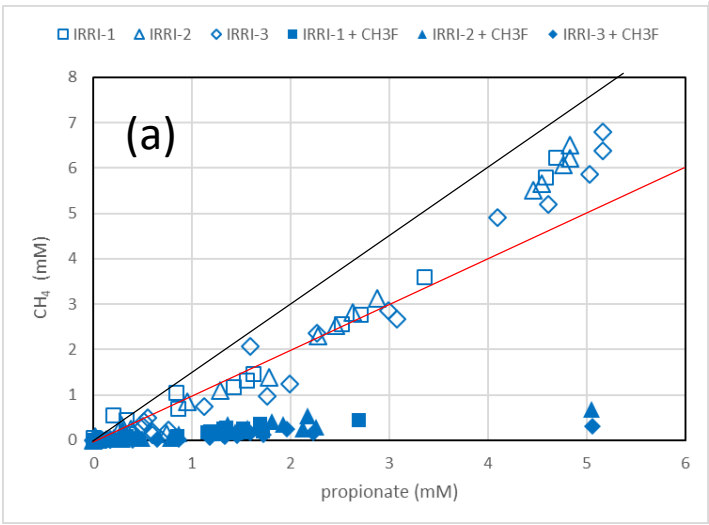
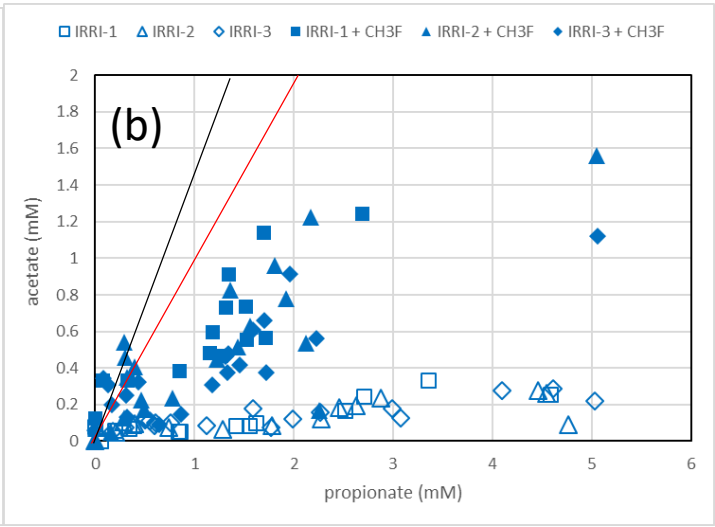

Propionat
Prop+ CH3F
H2O
H2O + CH3F
Propionat
Prop+ CH3F
H2O
H2O + CH3F
(h)
δ13CO2 (‰)
Time (days)

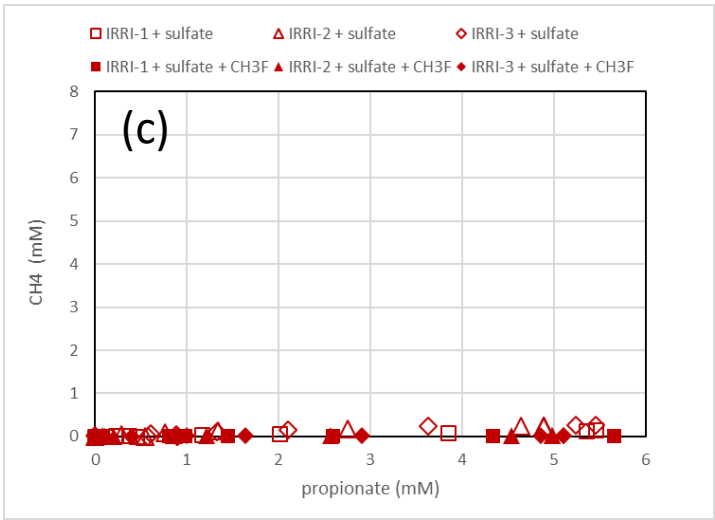
Fig. S1

without sulfate





with sulfate



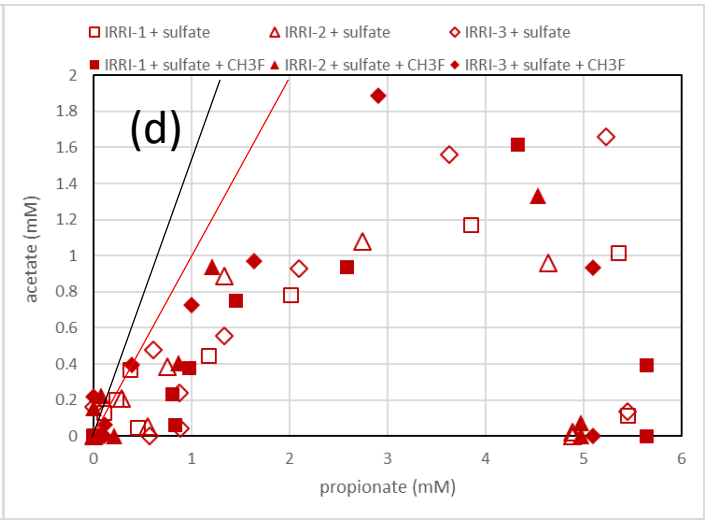
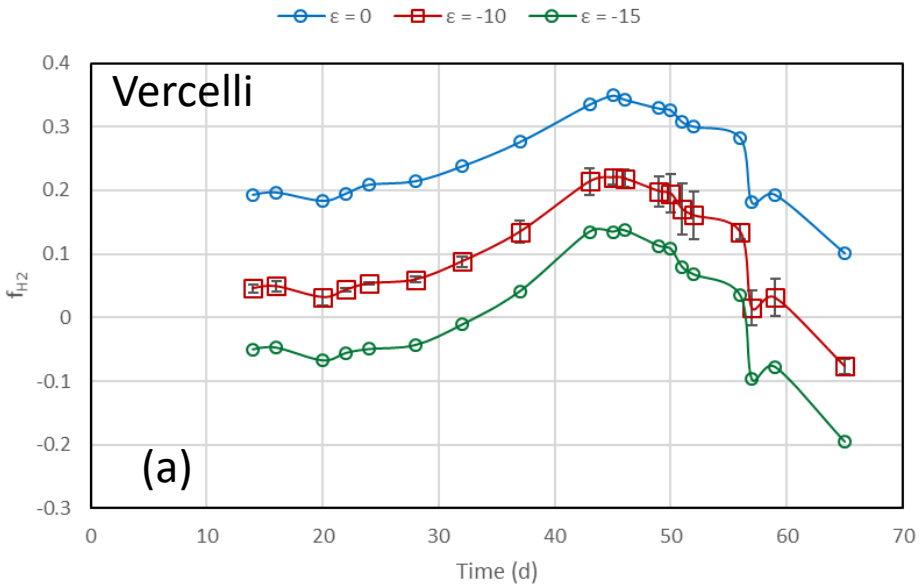
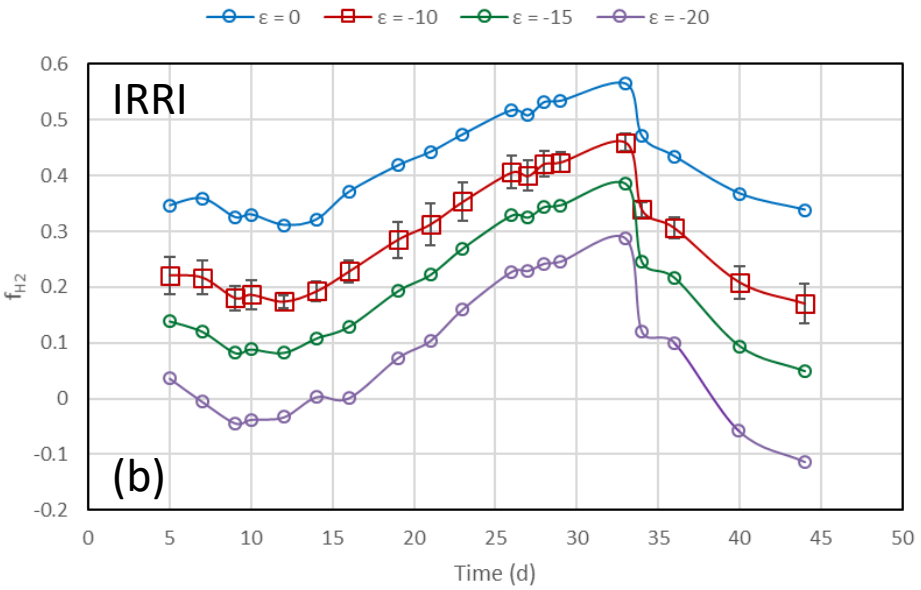


Fig. S2


ε = 0
ε = -10
ε = -15
Vercelli
(a)
f_{H2}
Time (d)


ε = 0
ε = -10
ε = -15
ε = -20
IRRI
(b)
f_{H2}
Time (d)

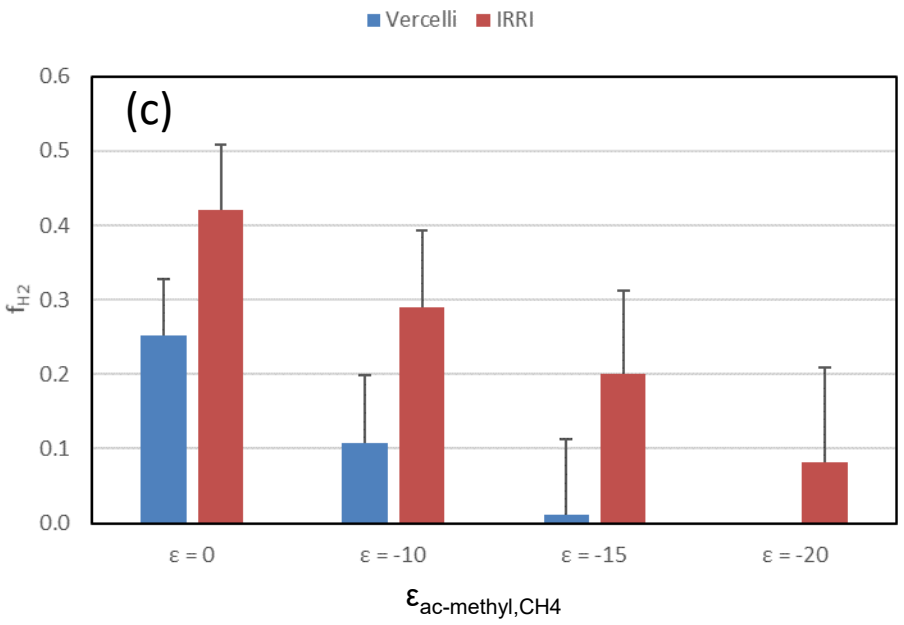

Vercelli
IRRI
(c)
f_{H2}
ε = 0
ε = -10
ε = -15
ε = -20
$\varepsilon_{ac\text{-}methyl,CH4}$

Fig. S3