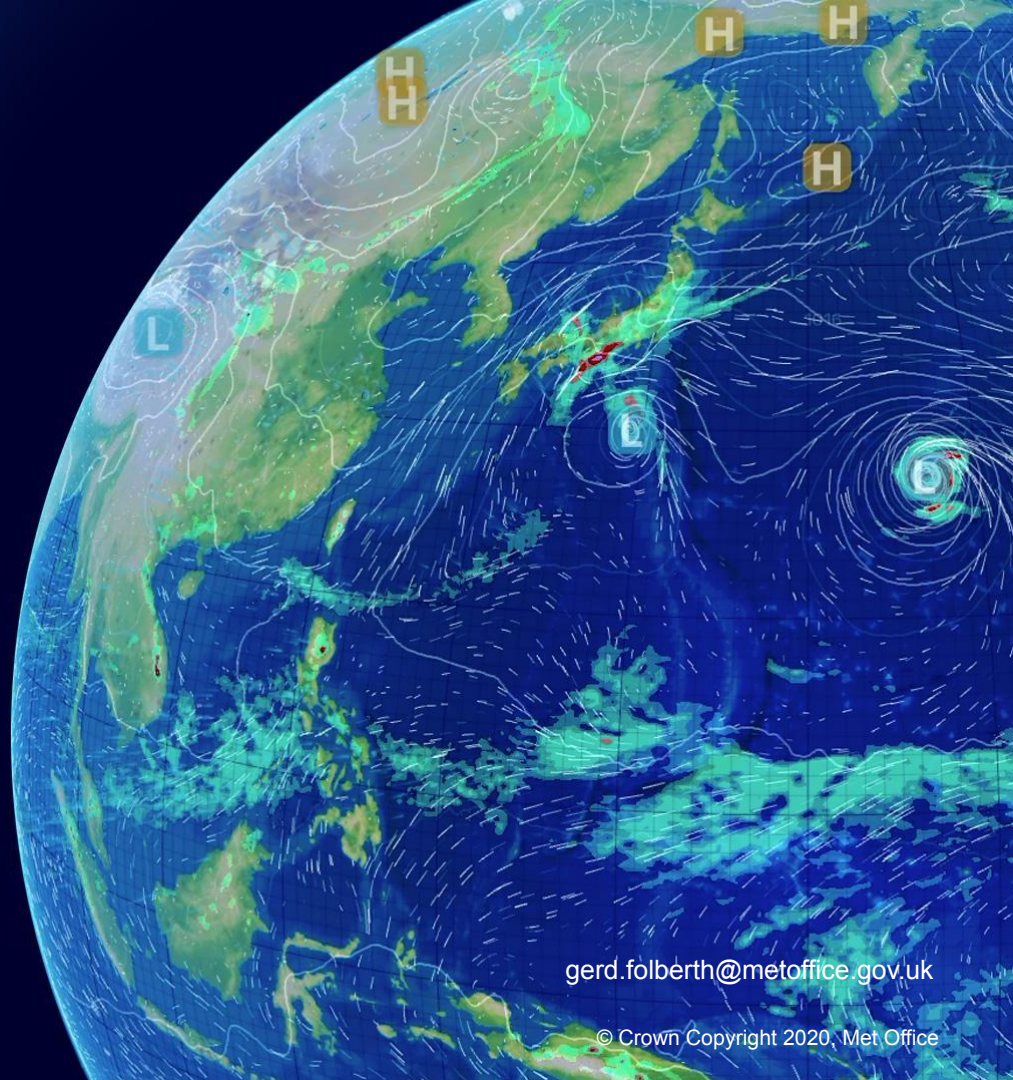# Methane Past, Present and Future

250-year Methane Trend from a Fully Interactive Earth System Model Simulation

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CH$_4$ Surface Mole Fraction – 1850 to 2100

CH$_4$ concentration-driven configuration
CH$_4$ emissions-driven configuration

$\Delta CH_4(PI \rightarrow PD)$ = ~1,100 ppbv

$\Delta CH_4(PI \rightarrow PD)$ = ~900 ppbv

$Error_{\Delta(PI \rightarrow PD)}$ in 2014: approx. -200 ppbv
$\%Error_{\Delta(PI \rightarrow PD)}$ in 2014: approx. -20%

similar CH$_4$ auto-feedback in both configurations
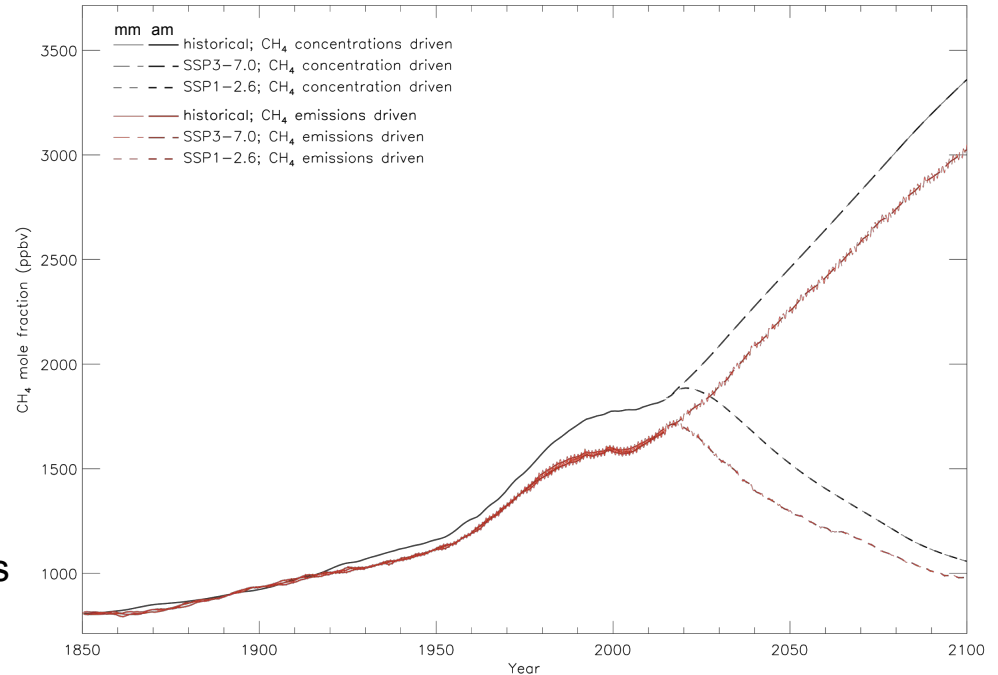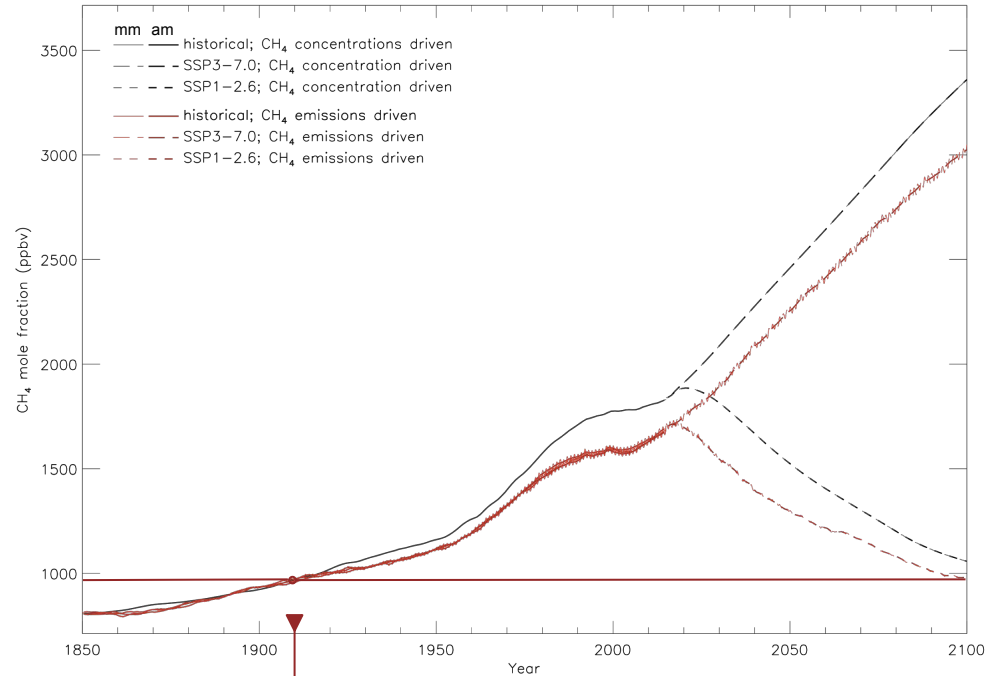
CH$_4$ Recovery under SSP1-2.6

Atmospheric Methane Content		
	surface mole fraction	whole atmosphere burden
1910s	986 ppbv	2675 Tg
2090s*	992 ppbv (+1%)	2750 Tg (+3%)
Main Methane Sources (Tg/yr)		
	wetlands	anthropogenic
1910s	169.3	91.6
2090s*	219.4 (+30%)	118.9 (+30%)
Main Methane Sinks (Tg/yr)		
	CH$_4$+OH✦	Soil Uptake
1910	-287.7	-18.7
2090s*	-384.1 (+34%)	-20.7 (+11%)

*for SSP1-2.6
✦whole atmosphere

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Simulating The Hiatus

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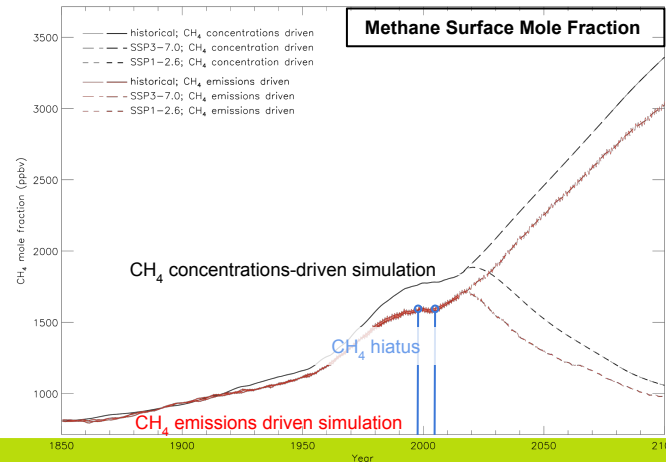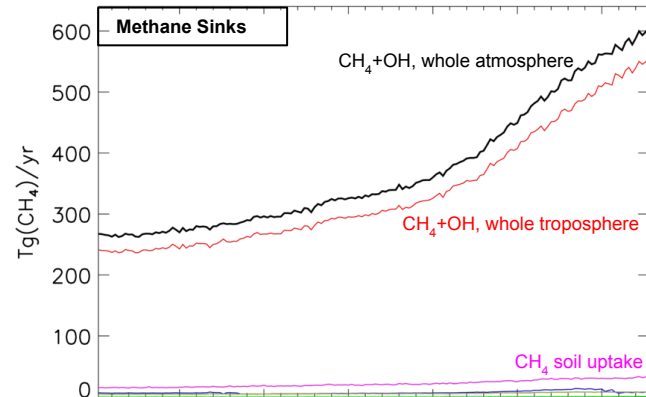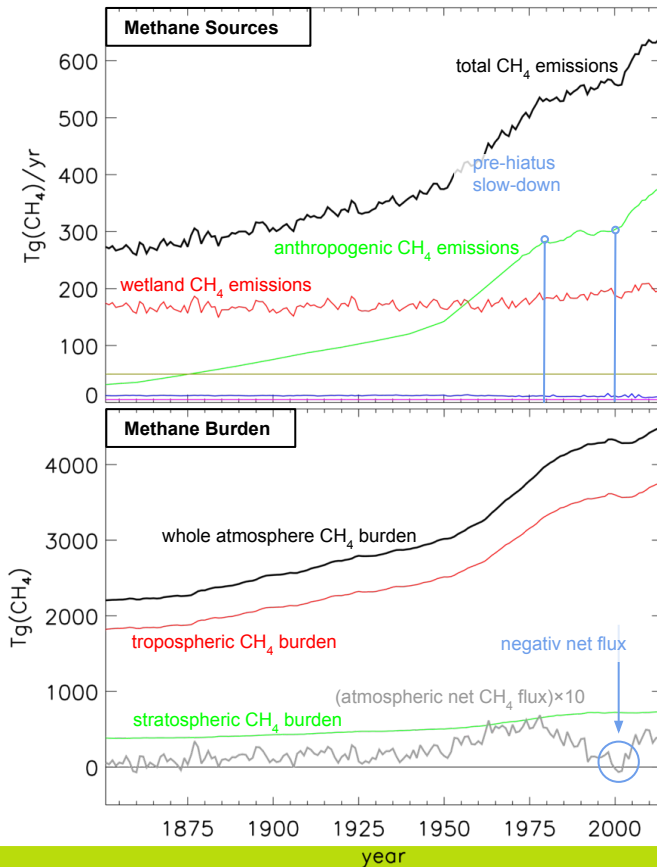
Key Points

- UKESM extension with fully coupled methane cycle

- Skill to simulate CH_4 same as skill to simulate CO_2 ~8 years ago

- CH_4 recovery – No easy way back but solid options for the future