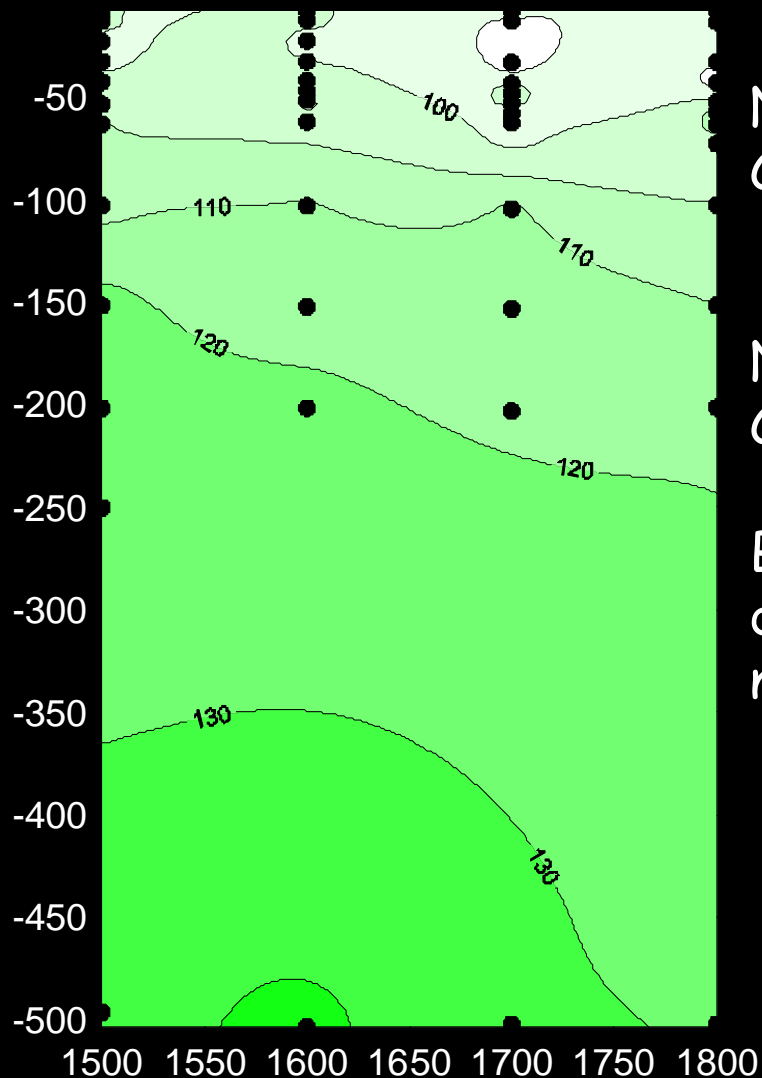


Nitrous oxide & Methane

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N_2O 315 ppbv - 5-6% "greenhouse effect"
 CH_4 1760 ppbv - 15%. Both increasing at ~ 0.7 ppbv/y

N_2O contributes to stratospheric ozone depletion
 CH_4 limits tropospheric oxidation capacity

Biogenically produced: oceanic source/sink
distributions largely influenced by oxygen and
nutrient status ..

"... but regulatory processes are complicated
and are currently not well understood."

Nitrous oxide - 2 microbial sources

Nitrification - aerobic release as by-product/intermediate during oxidation of NH_4 to NO_2 . N_2O proportional to AOU.

Denitrification - anaerobic reduction of NO_3 to N_2O and N_2 . Sub-oxia favours N_2O , anoxia favours N_2

Often tight coupling between nitrification and denitrification

Oceanic surface waters generally show low supersaturations

overlying sub-oxic waters and upwelling areas dominate ocean source: up to 300%. Little known for NW African upwelling.

Methane: most abundant organic volatile in atmosphere

Oceanic distribution controlled by the balance between 2 biotic processes

Methanogenesis - fermentation and remineralisation of organic carbon under anoxic conditions

Methane oxidation - under aerobic conditions
{n.b. $\text{CH}_4 \Rightarrow \text{CH}_3\text{OH} \Rightarrow \text{CO}_2$ }

Other upwelling areas suggest significant in-situ production though Bange et al report low CH_4 signal for NW African upwelling in 2005.

Aims:

Perform onboard analysis of surface underway and discrete profiles of dissolved (and atmospheric) N_2O and CH_4

Collect samples for analysis at PML of stable isotope signatures of N_2O & CH_4

Perform onboard incubations to determine source of N_2O (& oxidation of CH_4 ???)

Protocol:

1600 - 0400

Underway mapping (Cliff)

0400

Discrete sample - full profile
(onboard analysis N_2O/CH_4
& sample collection and storage for stable isotopes)

1000, 1400, 1800

Discrete samples - restricted depths
Sample collection for incubation experiments

Cliff - connection to non-toxic supply, sink for waste

0400 - 12 depths (?) x 2 litres - N₂O/CH₄
3 depths x 2 litres - stable isotopes
3 depths (CH₄ oxidation, ¹⁵N-NH₄ incubations)

1000 - 4 depths x 2 litres - N₂O/CH₄

1400 - 4 depths x 2 litres - N₂O/CH₄

1800 - 4 depths x 2 litres - N₂O/CH₄

Require: Nutrients, nitrification, oxygen, bacterial numbers & production at 0400 and when possible through day