

# Dissolved N<sub>2</sub>O and CH<sub>4</sub> measurements: Working towards a global network of ocean time series measurements of N<sub>2</sub>O and CH<sub>4</sub>

Sam T. Wilson<sup>1</sup> and Hermann W. Bange<sup>2</sup> on behalf of SCOR Working Group #143

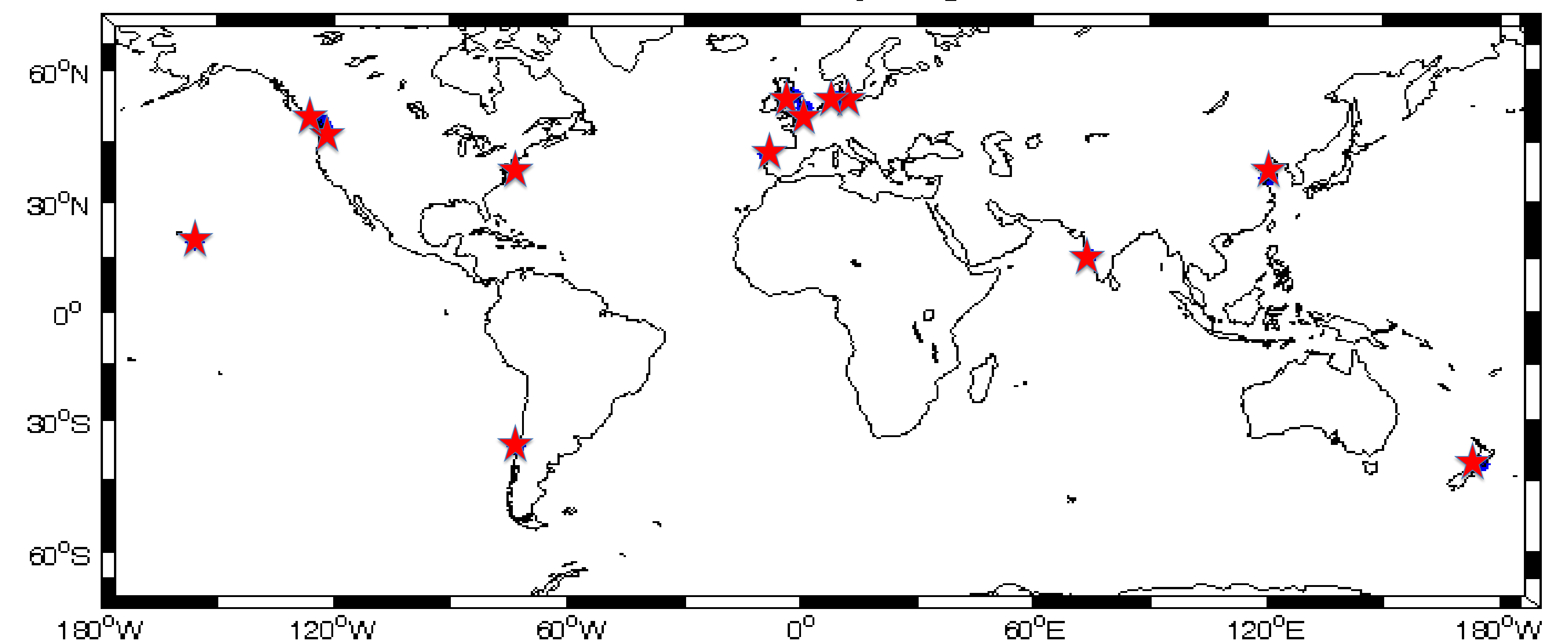
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## Background

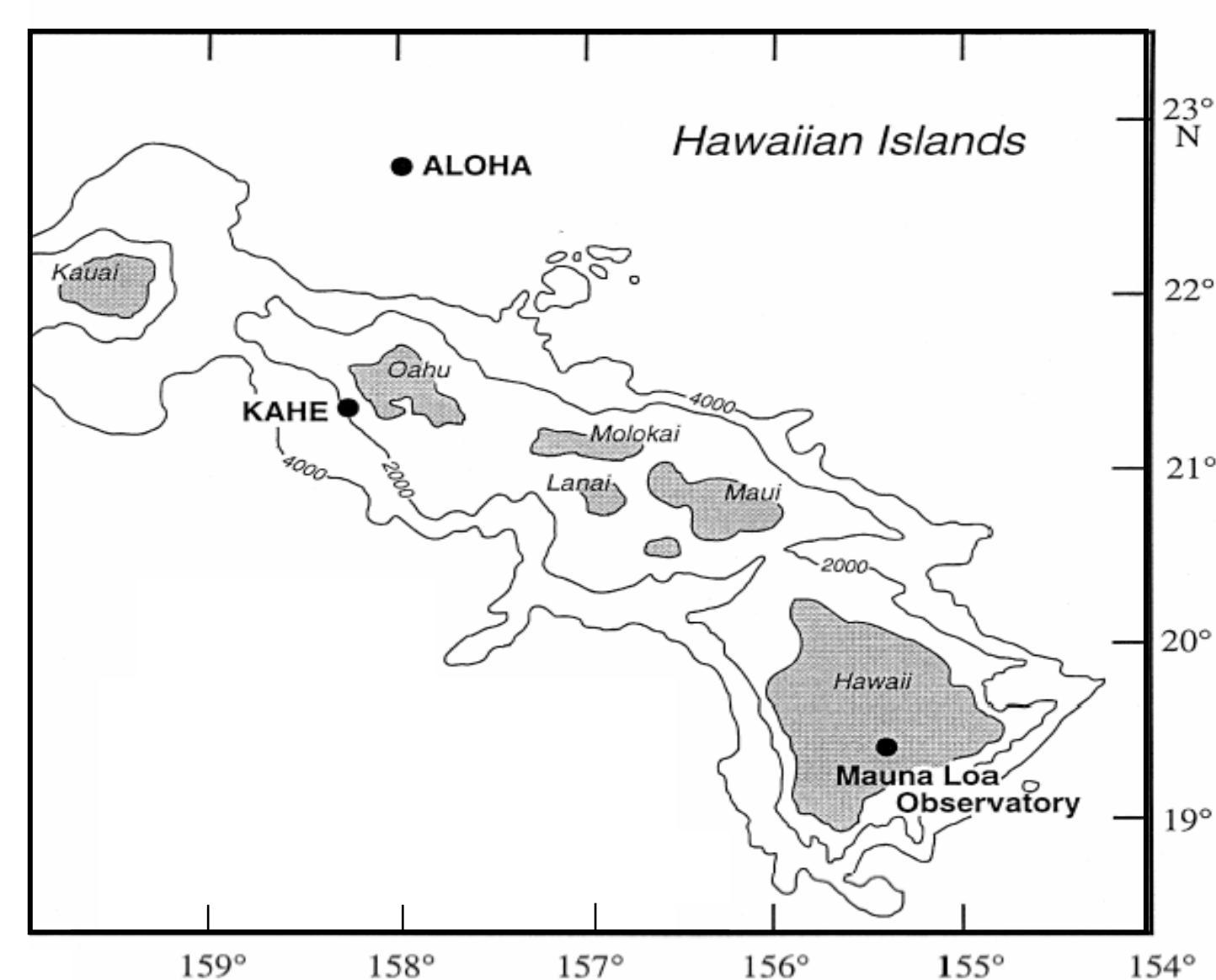
With ever-increasing global warming, quantifying the sources and sinks of greenhouse gases at the Earth's surface and documenting their seasonal and interannual variability is imperative. While much progress has been made in coordinating measurements of carbon dioxide in the global oceans, there has not been a similar effort for other key greenhouse gases including nitrous oxide and methane which are present in the marine environments at super-saturating concentrations. At the moment, nitrous oxide and methane are measured by multiple independent laboratories across the globe. In January 2014, we established a Scientific Committee of Oceanographic Research (SCOR) Working Group (#143) to improve and consolidate oceanic measurements of nitrous oxide and methane. The project is co-chaired by Sam Wilson (University of Hawaii) and Hermann Bange (GEOMAR, Kiel) and is currently conducting intercomparison of dissolved nitrous oxide and methane concentrations. **If you want your e-mail address to be added to the WG #143 mailing list please contact Sam Wilson (stwilson@hawaii.edu) and Hermann Bange (hbange@geomar.de).**

Since becoming a SCOR Working Group, the number of participants has increased and listed below are people who participated in first intercalibration exercise and/or will participate in the second one later in 2015/2016:

- Hermann Bange (GEOMAR, Germany)
- John Bullister (NOAA PMEL, USA)
- Mercedes de la Paz Arándiga (CSIC, Spain)
- Laura Farias (Universidad de Concepción, Chile)
- Jan Kaiser (University of East Anglia, UK)
- Laura Lapham (University of Maryland, USA)
- Cliff Law (NIWA, New Zealand)
- Wajih Naqvi (NIO, India)
- Andy Rees (Plymouth Marine Lab, UK)
- Gregor Rehder (IOW, Germany)
- Alyson Santoro (University of Maryland, USA)
- Philippe Tortell (U British Columbia, Canada)
- Robert Upstill-Goddard (U of Newcastle, UK)
- Sam Wilson (University of Hawaii, USA)
- Guiling Zhang (Ocean University of China, China)



## The first intercomparison exercise

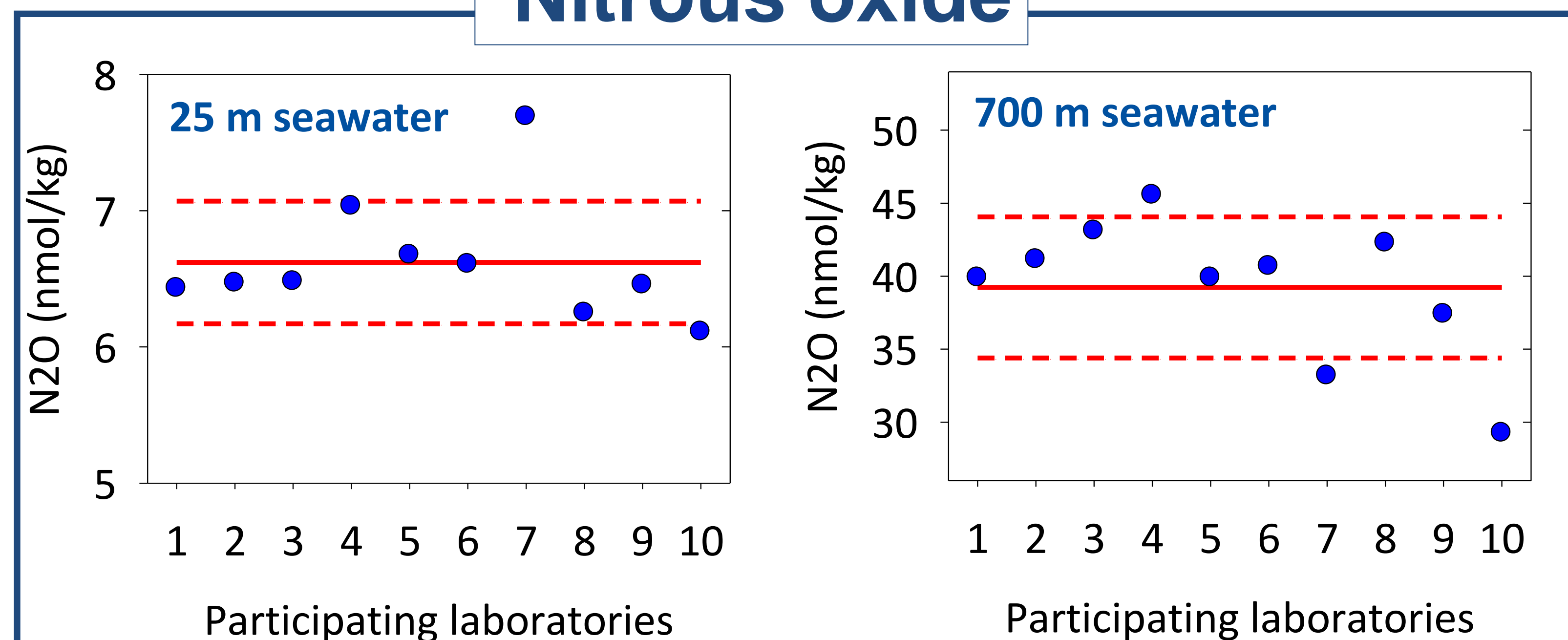


The first intercomparison exercise of dissolved nitrous oxide and methane was conducted in November 2013. Seawater samples were collected from depths of 25 m and 700 m (to provide a range of concentrations) at Station ALOHA, which is the long-term monitoring site for the Hawaii Ocean Time-series program in the oligotrophic North Pacific Ocean. Seawater samples were collected in borosilicate glass vials, preserved using mercuric chloride, and shipped to twelve laboratories for analysis.

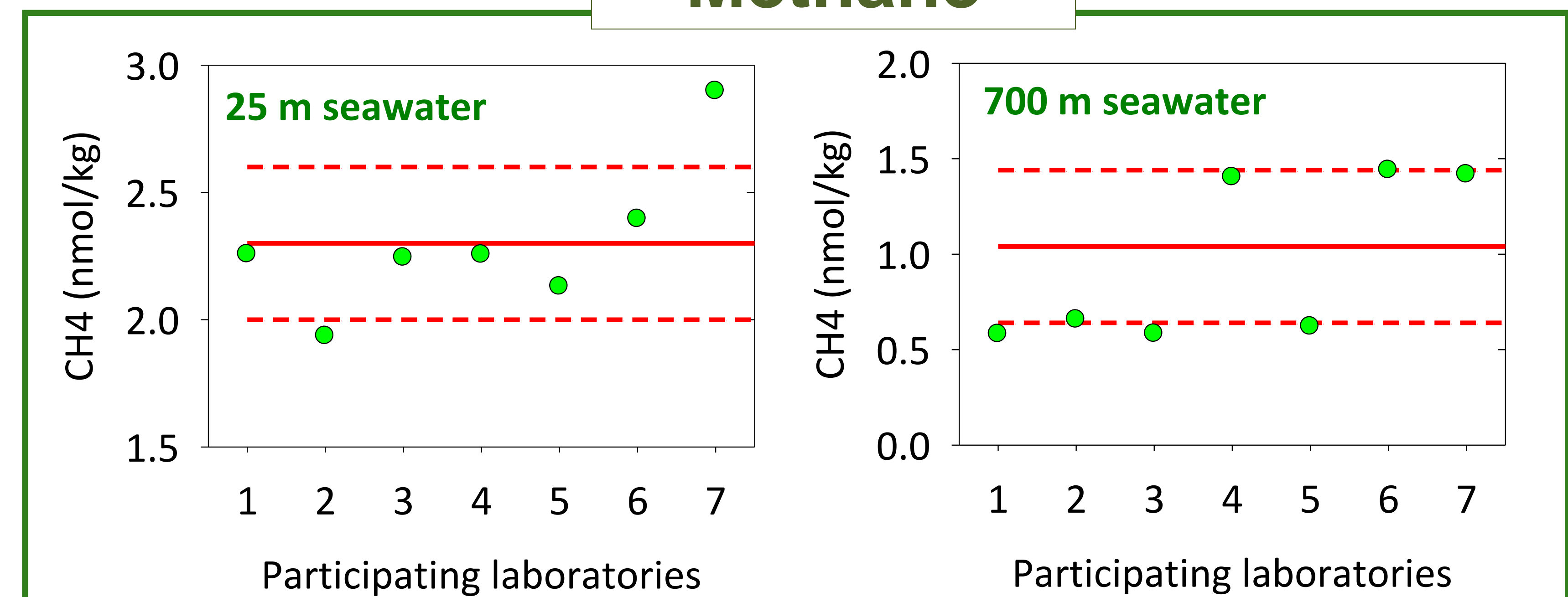
The Figures below show the concentrations of nitrous oxide and methane analyzed by each laboratory. The solid red line represents the average concentration and the dashed line represents the standard deviation. Greater variability in the measurements was observed in the deeper samples and for nitrous oxide which is typically measured using an electron capture detector this was partly attributed to the absence of a precise, high-concentration gas standard.



### Nitrous oxide



### Methane



## Production of nitrous oxide and methane standards



During the first intercomparison exercise it was evident that the production of precise nitrous oxide and methane standards available to all Working Group members was vital for the comparison of dissolved concentrations. Production of the gas standards became a top priority and funding was obtained from InGOS, SCOR, and NSF via C-MORE. A contractual agreement was established between NOAA PMEL and the University of Hawaii for the production of the standards. The gas standards have been shipped in June 2016 to the Working Group members. Once the lab groups have received the standards we will conduct a calibration comparison and then conduct a second comparison of seawater samples.



## Acknowledgements

This work was made possible by SCOR, C-MORE and InGOS. We are grateful to the Hawaii Ocean Time-series program for facilitating the sample collection for the first intercomparison exercise. We are also indebted to Professor David M. Karl for his continual support and advice for this collaborative effort and to John Bullister and Dave Wisegarver for their help and commitment to the production of the gas standards.

