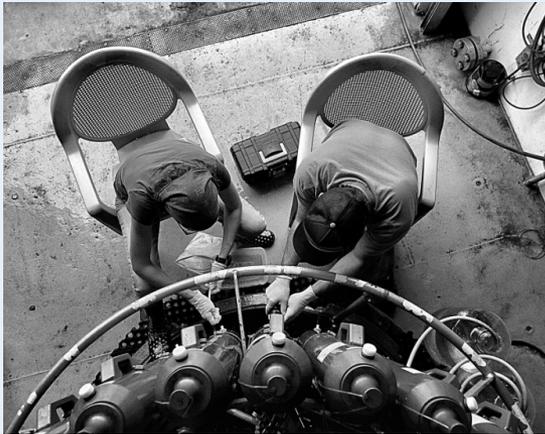


# SCOR Working Group #143: Oceanic methane and nitrous oxide

2021 Scientific Committee on Oceanic Research (SCOR) Annual Meeting

27 October 2021, 7am East Coast Time  
(noon UK time)

Sam Wilson (Newcastle University) and Hermann Bange (GEOMAR)

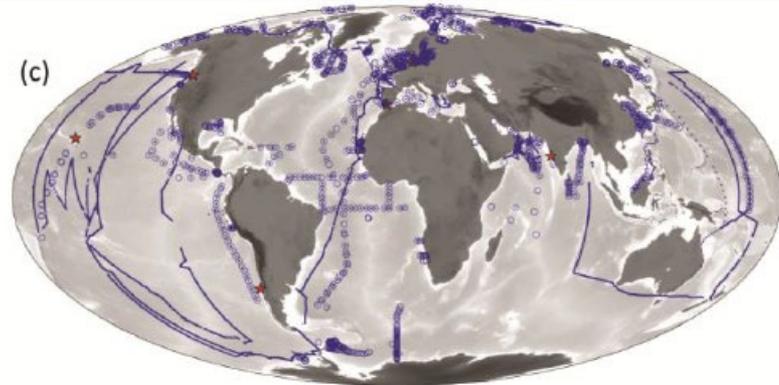
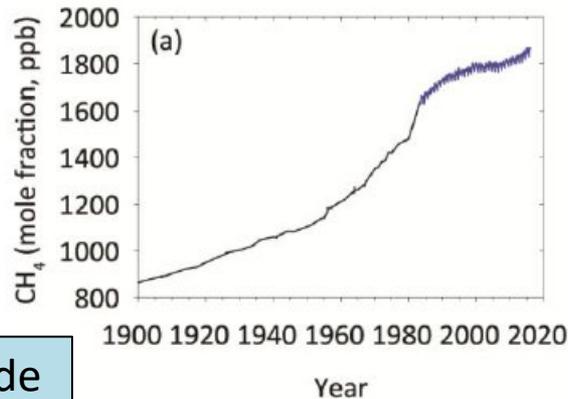


If you wish to go fast, go alone  
If you wish to go far, go together  
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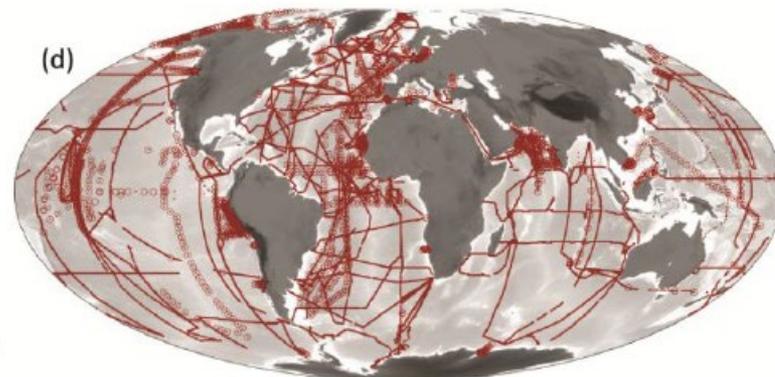
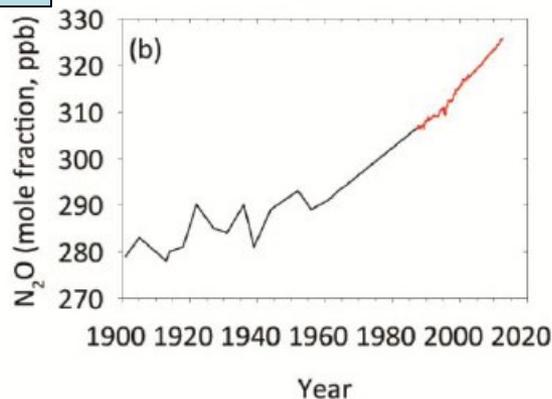
To date, oceanic methane and nitrous oxide observations have always been conducted by independent laboratories with no coordination of measurements.

SCOR WG#143 began the process of having a coordinated international program of methane and nitrous oxide measurements

## Methane



## Nitrous oxide



1. Conduct an intercalibration exercise between the time series programs → Wilson et al. (2018) An intercomparison of oceanic methane and nitrous oxide measurements. *Biogeosciences* 15, 5891–5907
2. Establish the appropriate standards to be used by the scientific community → Bullister et al. (2016) Technical Report: The production of methane and nitrous oxide gas standards for Scientific Committee on Ocean Research (SCOR) Working Group #143. pp 1-9.
3. Recommend the analytical reporting procedures to be used for N<sub>2</sub>O and CH<sub>4</sub> → *ongoing*
4. Establish framework for an N<sub>2</sub>O/CH<sub>4</sub> ocean time series network and write a global oceanic N<sub>2</sub>O/CH<sub>4</sub> summary paper for publication in an open access journal.
  - Bange et al. (2019) A harmonized nitrous oxide ocean observation network for the 21st century. *Front. Mar. Sci.* 6, 157.
  - Wilson et al. (2020) Ideas and perspectives: A strategic assessment of methane and nitrous oxide measurements in the marine environment. *Biogeosciences Discuss.* <https://doi.org/10.5194/bg-2020-270>.

## Working Group Terms of Reference

1. Conduct an intercalibration exercise between the time series programs
2. Establish the appropriate standards to be used by the scientific community
3. Recommend the analytical reporting procedures to be used for N<sub>2</sub>O and CH<sub>4</sub>
4. Establish framework for an N<sub>2</sub>O/CH<sub>4</sub> ocean time series network and write a global oceanic N<sub>2</sub>O/CH<sub>4</sub> summary paper for publication in an open access journal.

## Lessons learned after 6 years

It takes time!

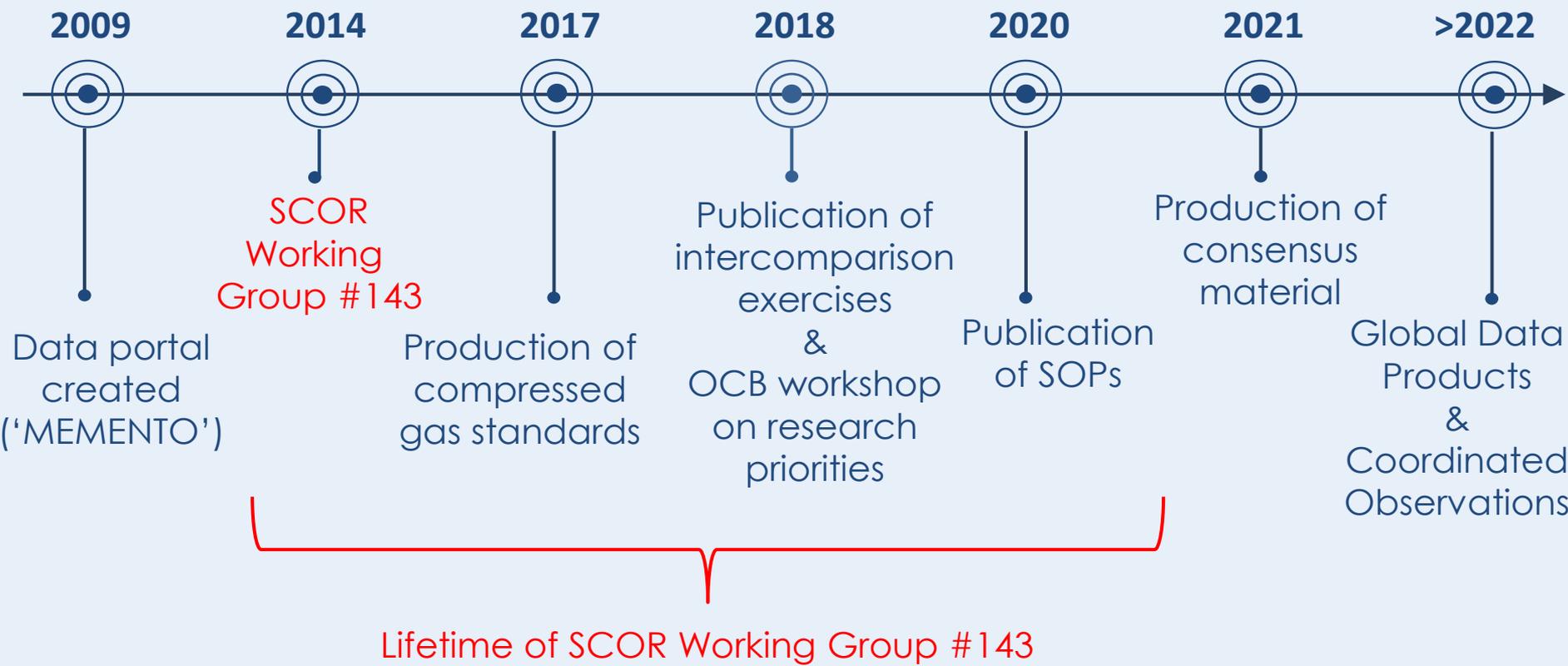
Invest in the scientific community. The publications include approximately 60 authors in total.

Seek help and learn from other groups who have conducted similar activities *e.g.* CO<sub>2</sub>, GEOTRACES

Try to establish clear goals *e.g.* what is the definition of high quality measurements? What are the priority areas of research?

The SCOR Working Group will end but the work continues

# Long term process of coordinating methane and nitrous oxide measurements



## Ideas and perspectives: A strategic assessment of methane and nitrous oxide measurements in the marine environment

Samuel T. Wilson<sup>1</sup>, Alia N. Al-Haj<sup>2</sup>, Annie Bourbonnais<sup>3</sup>, Claudia Frey<sup>4</sup>, Robinson W. Fulweiler<sup>2,5</sup>, John D. Kessler<sup>6</sup>, Hannah K. Marchant<sup>7</sup>, Jana Milucka<sup>7</sup>, Nicholas E. Ray<sup>5</sup>, Parv Suntharalingham<sup>8</sup>, Brett F. Thornton<sup>9</sup>, Robert C. Upstill-Goddard<sup>10</sup>, Thomas S. Weber<sup>6</sup>,

(35 authors)



<https://doi.org/10.5194/bg-2020-270>  
Preprint. Discussion started: 23 July 2020



### Best Practices for Dissolved Methane and Nitrous Oxide Measurements

SOP1 Sampling

SOP2 Calibration

SOP3 Internal controls

SOP4 Purge-and-trap measurements

SOP5 Headspace measurements

SOP6 Underway measurements

SOP7 Data reporting

SOP on Process measurements of CH<sub>4</sub>

SOP on Process measurements of N<sub>2</sub>O

Lead authors include:

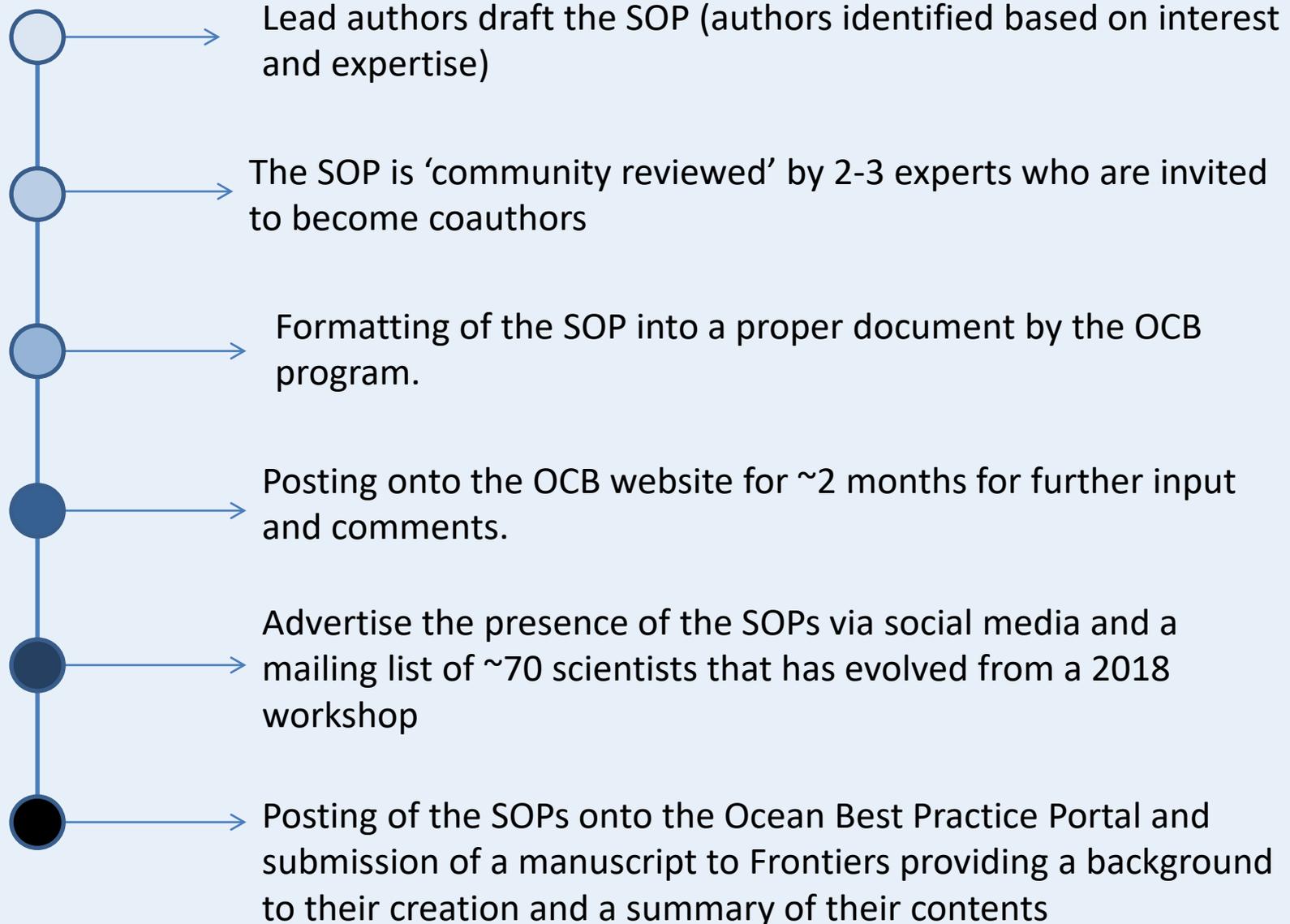
Damian Arévalo-Martínez, Annie Bourbonnais, Bonnie Chang, Mercedes de la Paz, Sara Ferrón, Claudia Frey, John D. Kessler, Annette Kock, Cara Manning, Gregor Rehder, Robert Upstill-Goddard, Sam Wilson

#### Highlights include

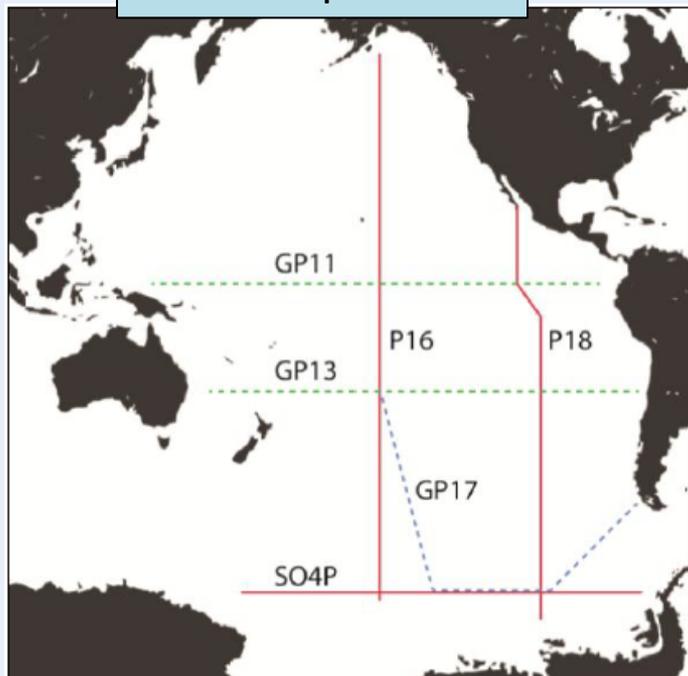
- Best Practices for Purge & Trap and Headspace Equilibrium measurements
- Working with the Electron Capture Detector
- Establishing internal controls
- Best practices with continual underway measurements

Each SOP will be posted on the Ocean Carbon & Biogeochemistry website for 2 months, prior to uploading to the Ocean Best Practice portal

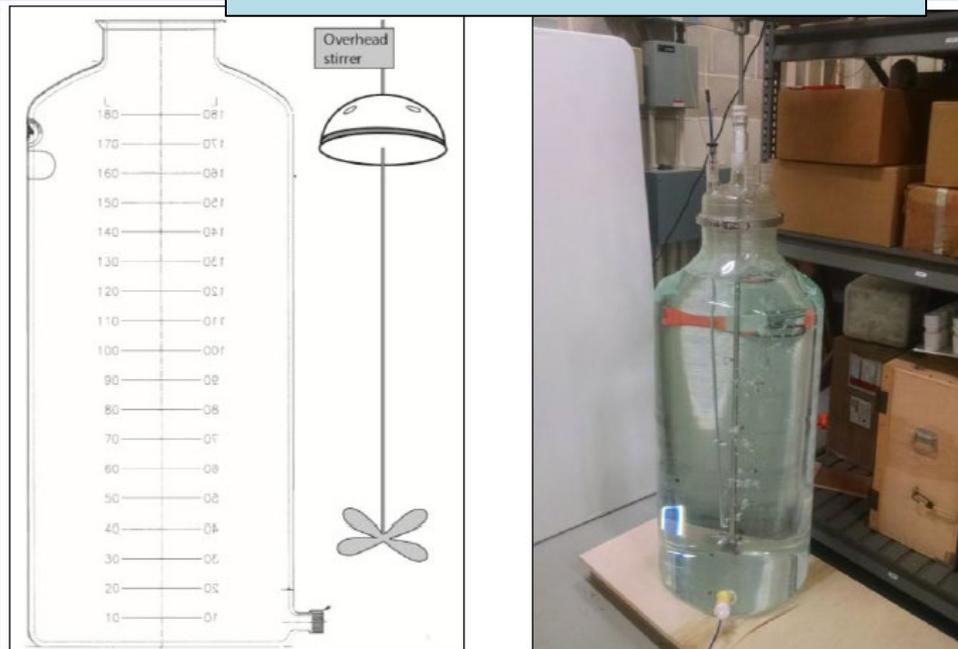
## Process for production of SOPs



### Future expeditions



### Production of consensus material



#### Text Box 1. Relevant Definitions

- Internal Controls: Material of sufficient accuracy to provide a useful self-assessment evaluation of the analytical method.
- Consensus Material: Material with properties of a communally agreed value better than 1%, as measured by multiple laboratories.

## Acknowledgements

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The progress made so far and the ongoing efforts are the results of a large number of scientists. Publications resulting from this work are included below:

Wilson et al. (2020) Ideas and perspectives: A strategic assessment of methane and nitrous oxide measurements in the marine environment. *Biogeosciences Discuss.* <https://doi.org/10.5194/bg-2020-270>.

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