

Release of SOCAT Version 5 – SOCAT at 10

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Abstract - The Surface Ocean CO₂ Atlas (SOCAT, www.socat.info) is a synthesis activity by the international marine carbon research community (>100 contributors). SOCAT version 5 has 21.5 million quality-controlled, surface ocean fCO₂ (fugacity of carbon dioxide) observations from 1957 to 2017 for the global oceans and coastal seas. Calibrated sensor data are also available. Automation allows annual, public releases. SOCAT data is discoverable, accessible and citable. SOCAT enables quantification of the ocean carbon sink and ocean acidification and evaluation of ocean biogeochemical models. SOCAT, which celebrates its 10th anniversary in 2017, represents a milestone in biogeochemical and climate research and in informing policy.

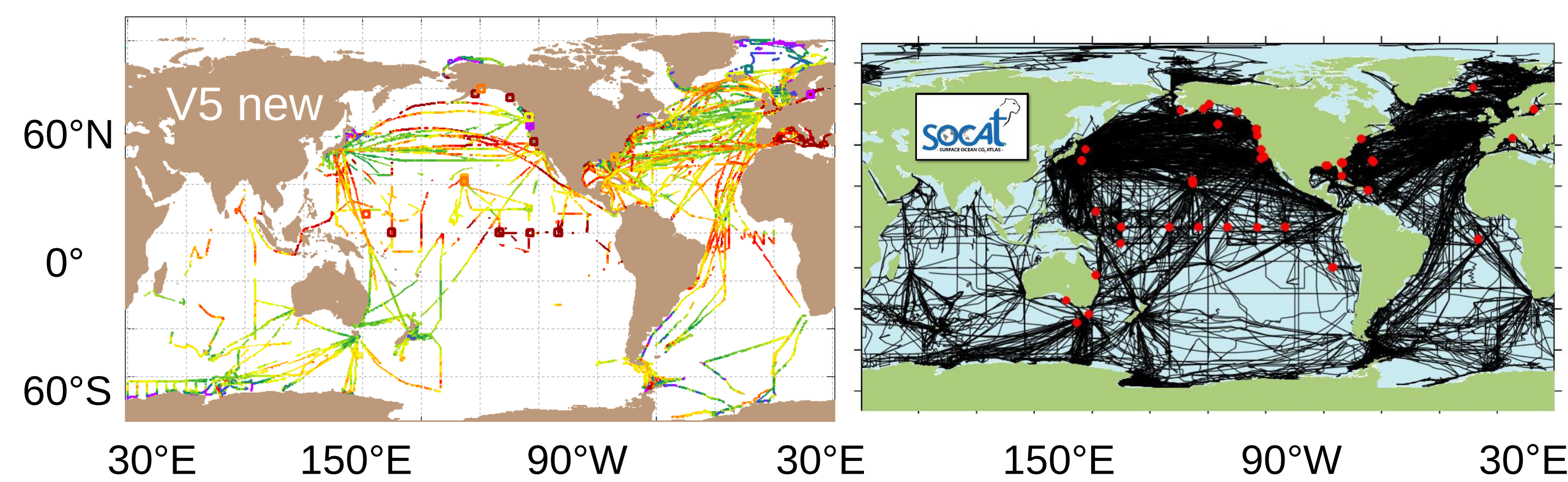


Fig. 1. a) New fCO₂ values (µatm) in version 5. b) Location of moorings (red), and tracks of ships and drifters (black) for all data in version 5.

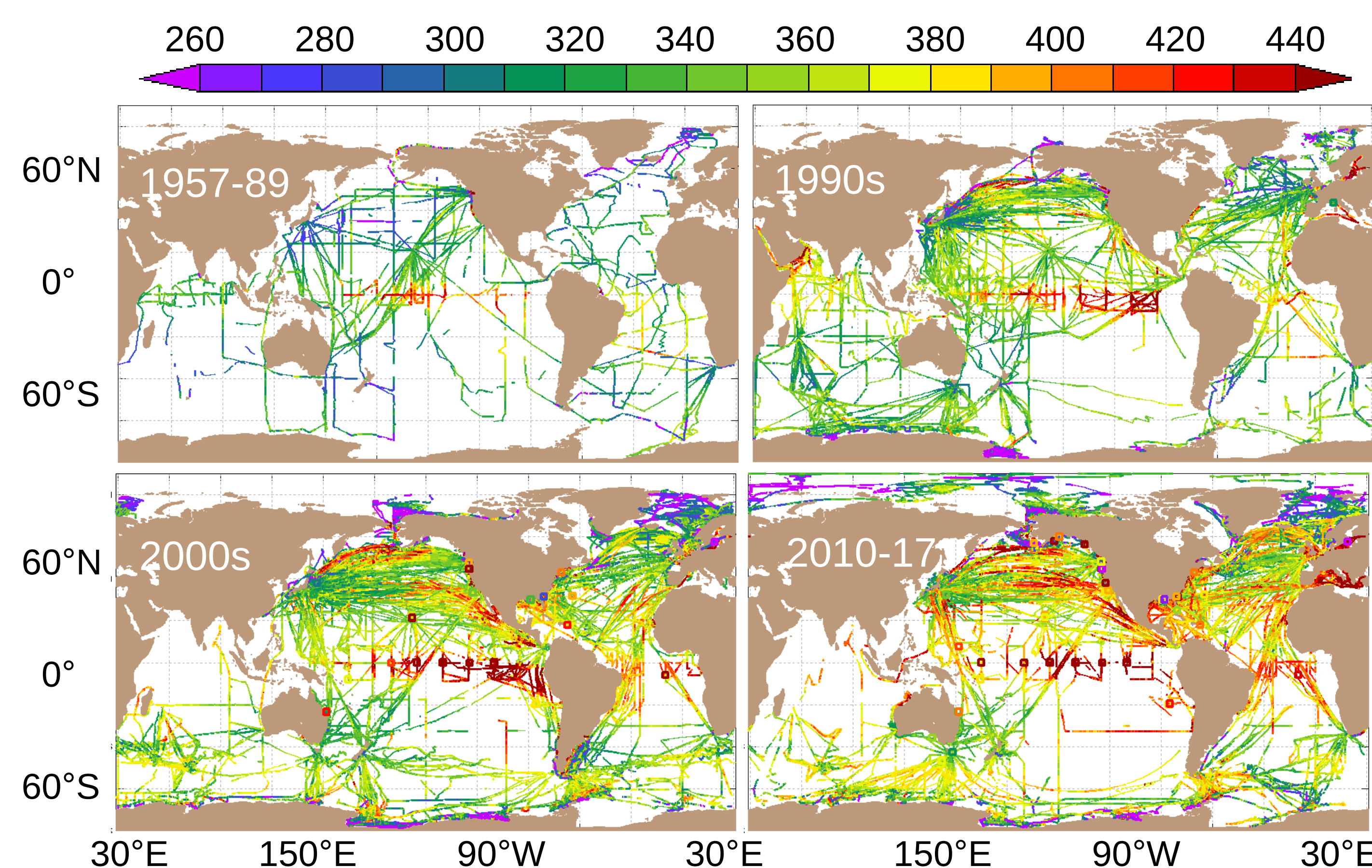


Fig. 2. Surface water fCO₂ values (µatm) for 1957-89, 1990s, 2000s and 2010-17 in version 5 (data set flags A-E).

Key features:

- Synthesis and gridded, quality controlled products of surface ocean fCO₂ observations for the global oceans and coastal seas:
 - V5 (2017): 21.5 million fCO₂, 1957 - 2017,
 - V4 (2016): 18.5 million fCO₂, 1957 - 2015,
 - V3 (2015): 14.5 million fCO₂, 1957 - 2014,
 - V2 (2013): 10.1 million fCO₂, 1968 - 2011,
 - V1 (2011): 6.3 million fCO₂, 1968 - 2007,
 with an accuracy for fCO₂ < 5 µatm (data set flags of A-D).
- Calibrated sensor data also available (<10 µatm, flag of E).
- Same quality control (QC) criteria in versions 3 to 5.
- Sea surface temperature and salinity not QCed.
- Atmospheric CO₂ and other surface water parameters archived.
- No sustained funding.
- V6 submission ends 15/01/2018, QC ends 31/03/2018.

Annual releases:

- Automation enables annual, public releases.
- Automation of metadata upload in progress.
- Online viewers and downloadable via www.socat.info.

Scientific impact:

- Large year-to-year variation in the global ocean carbon sink^{b,e,f}.
- Models underestimate variation in ocean carbon sink^f.
- SOCAT enables quantification of the ocean carbon sink^{b,e}, ocean acidification^c and (indirectly) of the land carbon sink^d.
- SOCAT informs mapping products^{b,e,f}, the Surface Ocean pCO₂ Mapping Intercomparison^f and the Global Carbon Budget^d.
- SOCAT is used for model evaluation^d, including CMIP^a.
- Cited by >180 peer-reviewed scientific articles and high-impact reports.

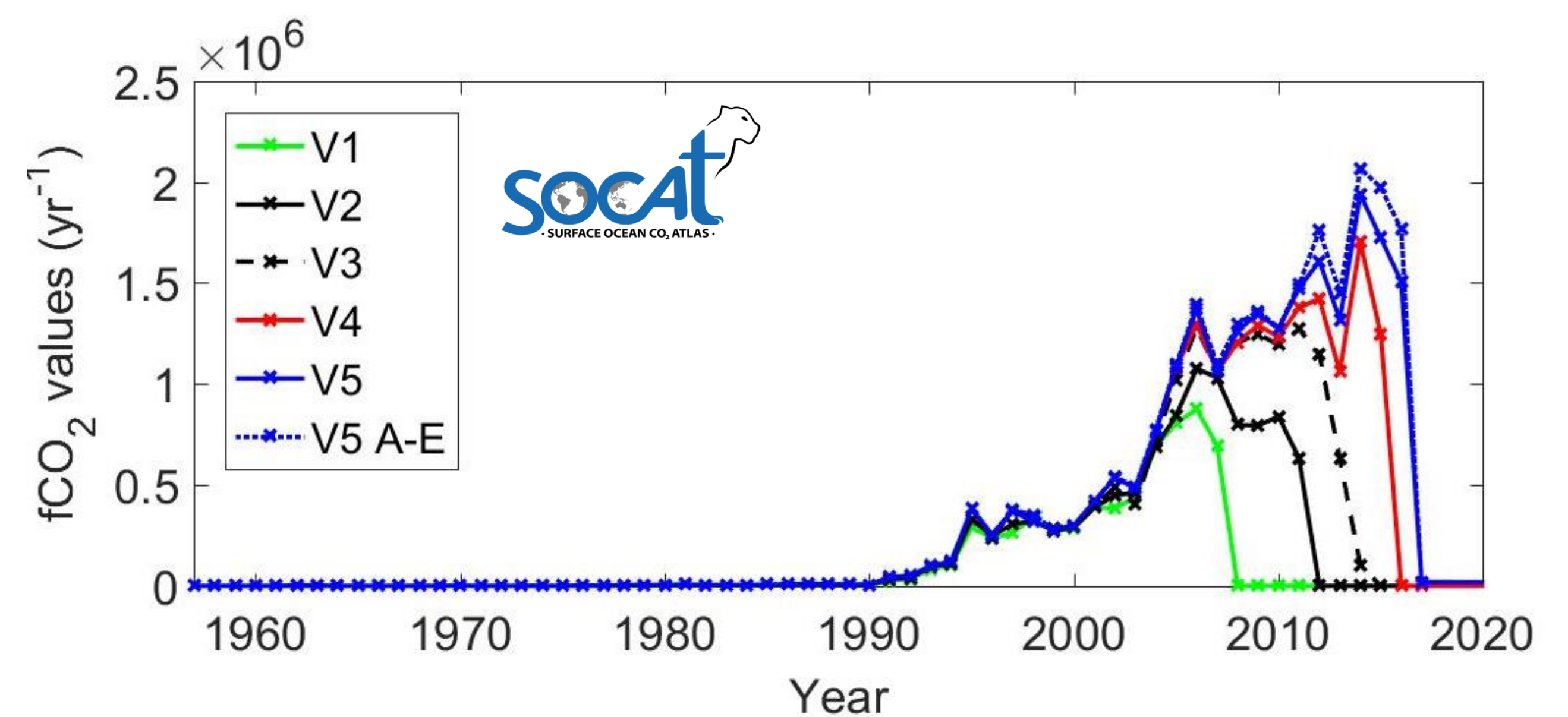


Fig. 3. Number of surface water fCO₂ values per year with flags of A-D in versions 1 to 5 (accuracy < 5 µatm) and with flags of A-E (accuracy < 10 µatm) in version 5.

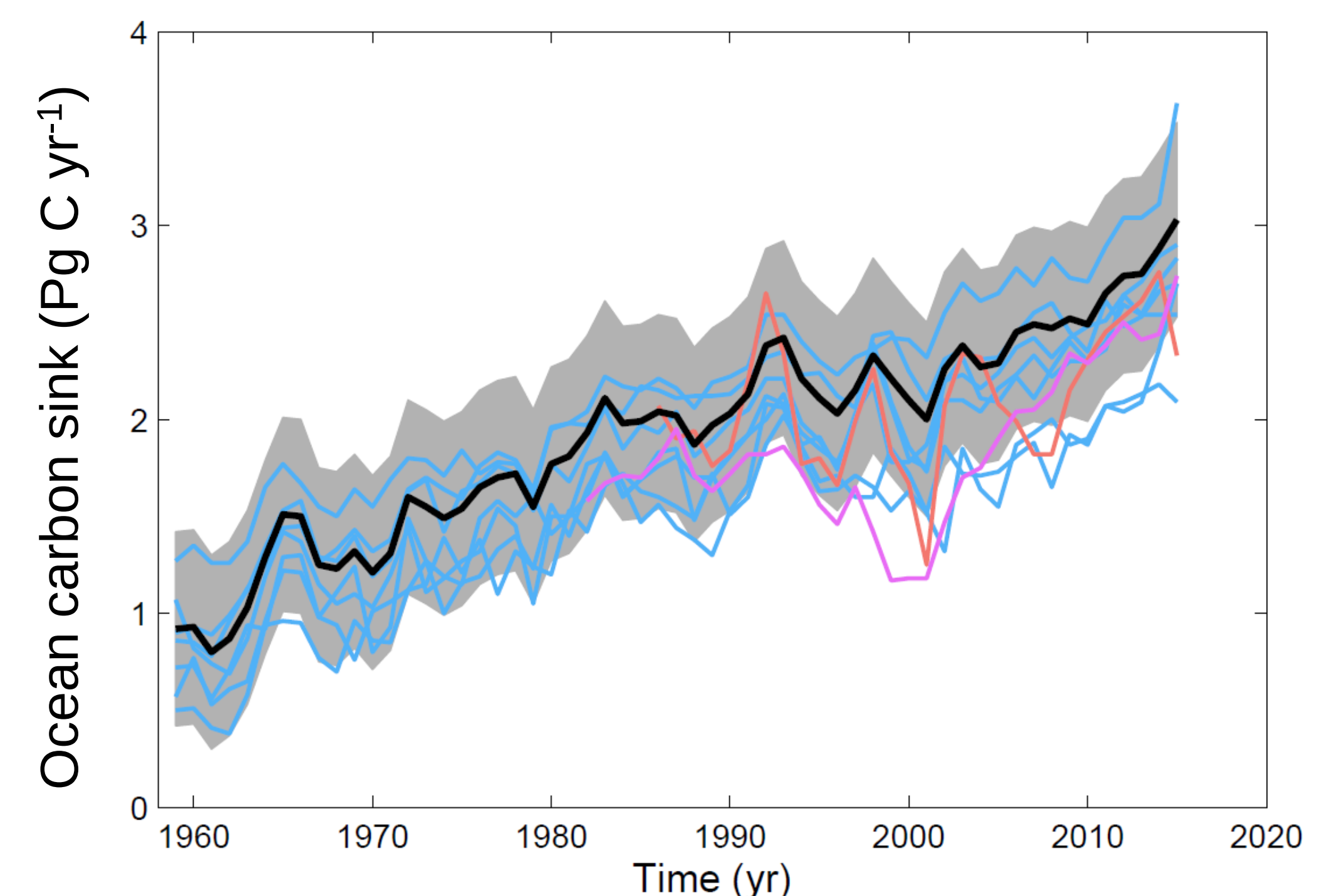


Fig. 4. SOCAT enables quantification of the net anthropogenic ocean carbon uptake in the 2016 Global Carbon Budget^d. Shown are SOCAT-based mapping results (pink^b and orange^e lines), model results (blue lines), the model ensemble mean (black) and model uncertainty (grey shading). From Le Quéré et al., 2016^d.

Fair Data Use - To generously acknowledge the contribution of SOCAT scientists by invitation to co-authorship, especially for data providers in regional studies, and/or reference to relevant scientific articles.

Acknowledgements – We thank the numerous contributors, funding agencies, IOCCP, SOLAS and IMBER.

Documentation – **V3-V5**: Bakker et al. (2016) ESSD 8: 383-413; **V2**: Bakker et al. (2014) ESSD 6:69-90; **V1**: Pfeil et al. (2013) ESSD 5:125-143; Sabine et al. (2013) ESSD 5:145-153.

References – Eyring et al., 2016^a; Landschützer et al., 2014^b; Lauvset et al., 2015^c; Le Quéré et al., 2016^d; Rödenbeck et al., 2014^e, 2015^f.

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