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# Data Use Statement for SOCAT v2023

The synthesis and gridded SOCAT products are a result of scientific effort by data providers, data managers and quality controllers. It is important that users of the SOCAT products acknowledge this effort. This will help generate funding for continuation of observational products and promote further sharing of data.

We expect that users of SOCAT v2023:

**1) Generously acknowledge the contribution of SOCAT data providers and investigators in the form of invitation to co-authorship**, reference to relevant scientific articles by data providers or by naming data providers in the acknowledgements. **Specifically, in regional studies invite large data providers,** who possess valuable expert knowledge on data and region, **to collaborate at an early stage, which may lead to an invitation of co-authorship.** We recognize that co-authorship is only justified in case of a significant scientific contribution to a publication and that provision of data on its own does not warrant co-authorship.

**2) Reference the relevant SOCAT data product AND methods paper(s):**

## Data product:

Bakker, Dorothee C. E.; Alin, Simone R.; Bates, Nicholas; Becker, Meike; Feely, Richard A.; Gkritzalis, Thanos; Jones, Steve D.; Kozyr, Alex; Lauvset, Siv K.; Metzl, Nicolas; Munro, David R.; Nakaoka, Shin-ichiro; Nojiri, Yukihiro; O'Brien, Kevin M.; Olsen, Are; Pierrot, Denis; Rehder, Gregor; Steinhoff, Tobias; Sutton, Adrienne J.; Sweeney, Colm; Tilbrook, Bronte; Wada, Chisato; Wanninkhof, Rik; Akl, John; Barbero, Leticia; Beatty, Cory M.; Berghoff, Carla F.; Bittig, Henry C.; Bott, Randy; Burger, Eugene F.; Cai, Wei-Jun; Castaño-Primo, Rocío; Corredor, Jorge E.; Cronin, Margot; De Carlo, Eric H.; DeGrandpre, Michael D.; Dietrich, Colin; Drennan, William M.; Emerson, Steven R.; Enochs, Ian C.; Enyo, Kazutaka; Epherra, Lucía; Evans, Wiley; Fiedler, Björn; Fontela, Marcos; Frangoulis, Constantin; Gehrung, Martina; Giannoudi, Louisa; Glockzin, Michael; Hales, Burke; Howden, Stephan D.; Ibánhez, J. Severino P.; Kamb, Linus; Körtzinger, Arne; Lefèvre, Nathalie; Lo Monaco, Claire; Lutz, Vivian A.; Macovei, Vlad A.; Maenner Jones, Stacy; Manalang, Dana; Manzello, Derek P.; Metzl, Nicolas; Mickett, John; Millero, Frank J.; Monacci, Natalie M.; Morell, Julio M.; Musielewicz, Sylvia; Neill, Craig; Newberger, Tim; Newton, Jan; Noakes, Scott; Ólafsdóttir, Sólveig Rósa; Ono, Tsuneo; Osborne, John; Padín, Xose A.; Paulsen, Melf; Perivoliotis, Leonidas; Petersen, Wilhelm; Petihakis, George; Plueddemann, Albert J.; Rodriguez, Carmen; Rutgersson, Anna; Sabine, Christopher L.; Salisbury, Joseph E.; Schlitzer, Reiner; Skjelvan, Ingunn; Stamataki, Natalia; Sullivan, Kevin F.; Sutherland, Stewart C.; T'Jampens, Michiel; Tadokoro, Kazuaki; Tanhua, Toste; Telszewski, Maciej; Theetaert, Hannelore; Tomlinson, Michael; Vandemark, Douglas; Velo, Antón; Voynova, Yoana G.; Weller, Robert A.; Whitehead, Chris; Wimart-Rousseau, Cathy (2023). Surface Ocean CO2 Atlas Database Version 2023 (SOCATv2023) (NCEI Accession 0278913). NOAA National Centers for Environmental Information. Dataset. https://doi.org/10.25921/r7xa-bt92.

### Methods papers (for gridded products reference both papers):

Bakker, D. C. E., Pfeil, B. Landa, C. S., Metzl, N., O'Brien, K. M., Olsen, A., Smith, K., Cosca, C., Harasawa, S., Jones, S. D., Nakaoka, S., Nojiri, Y., Schuster, U., Steinhoff, T., Sweeney, C., Takahashi, T., Tilbrook, B., Wada, C., Wanninkhof, R., Alin, S. R., Balestrini, C. F., Barbero, L., Bates, N. R., Bianchi, A. A., Bonou, F., Boutin, J., Bozec, Y., Burger, E. F., Cai, W.-J., Castle, R. D., Chen, L., Chierici, M., Currie, K., Evans, W., Featherstone, C., Feely, R. A., Fransson, A., Goyet, C., Greenwood, N., Gregor, L., Hankin, S., Hardman-Mountford, N. J., Harlay, J., Hauck, J., Hoppema, M., Humphreys, M. P., Hunt, C. W., Huss, B., Ibánhez, J. S. P., Johannessen, T., Keeling, R., Kitidis, V., Körtzinger, A., Kozyr, A., Krasakopoulou, E., Kuwata, A., Landschützer, P., Lauvset, S. K., Lefèvre, N., Lo Monaco, C., Manke, A., Mathis, J. T., Merlivat, L., Millero, F. J., Monteiro, P. M. S., Munro, D. R., Murata, A., Newberger, T., Omar, A. M., Ono, T., Paterson, K., Pearce, D., Pierrot, D., Robbins, L. L., Saito, S., Salisbury, J., Schlitzer, R., Schneider, B., Schweitzer, R., Sieger, R., Skjelvan, I., Sullivan, K. F., Sutherland, S. C., Sutton, A. J., Tadokoro, K., Telszewski, M., Tuma, M., Van Heuven, S. M. A. C., Vandemark, D., Ward, B., Watson, A. J., Xu, S. (2016) A multi-decade record of high quality $fCO_2$ data in version 3 of the Surface Ocean $CO_2$ Atlas (SOCAT). Earth System Science Data 8: 383-413. doi:10.5194/essd-8-383-2016.

Sabine, C. L., Hankin, S., Koyuk, H., Bakker, D. C. E., Pfeil, B., Olsen, A., Metzl, N., Kozyr, A., Fassbender, A., Manke, A., Malczyk, J., Akl, J., Alin, S. R., Bellerby, R. G. J., Borges, A., Boutin, J., Brown, P. J., Cai, W.-J., Chavez, F. P., Chen, A., Cosca, C., Feely, R. A., González-Dávila, M., Goyet, C., Hardman-Mountford, N., Heinze, C., Hoppema, M., Hunt, C. W., Hydes, D., Ishii, M., Johannessen, T., Key, R. M., Körtzinger, A., Landschützer, P., Lauvset, S. K., Lefèvre, N., Lenton, A., Lourantou, A., Merlivat, L., Midorikawa, T., Mintrop, L., Miyazaki, C., Murata, A., Nakadate, A., Nakano, Y., Nakaoka, S., Nojiri, Y., Omar, A. M., Padin, X. A., Park, G.-H., Paterson, K., Perez, F. F., Pierrot, D., Poisson, A., Ríos, A. F., Salisbury, J., Santana-Casiano, J. M., Sarma, V. V. S. S., Schlitzer, R., Schneider, B., Schuster, U., Sieger, R., Skjelvan, I., Steinhoff, T., Suzuki, T., Takahashi, T., Tedesco, K., Telszewski, M., Thomas, H., Tilbrook, B., Vandemark, D., Veness, T., Watson, A. J., Weiss, R., Wong, C. S., and Yoshikawa-Inoue, H. (2013) Surface Ocean $CO_2$ Atlas (SOCAT) gridded data products, Earth Syst. Sci. Data, 5, 145-153. doi:10.5194/essd-5-145-2013.

### 3) Include in the acknowledgements:

'The Surface Ocean $CO_2$ Atlas (SOCAT) is an international effort, endorsed by the SCOR Infrastructural Project International Ocean Carbon Coordination Project (IOCCP) and the Surface Ocean Lower-Atmosphere Study (SOLAS), to deliver a uniform, quality-controlled surface ocean $CO_2$ database. The many researchers and funding agencies responsible for the collection of data and quality control are thanked for their contributions to SOCAT.'

### 4) Report Problems to submit@socat.info.

### 5) Inform submit@socat.info of publications in which SOCAT is used.

## More Information

More information on citing SOCAT, including information on citing other versions of SOCAT, can be found at https://www.socat.info/cite.

## Examples of the application of this Data Use Statement

**A regional study** of long-term trends of surface water $fCO_2$ in the West Sea for the years 1990 to 2023 using SOCAT version 2024. Most (90%) of the $fCO_2$ data in this area has been collected by three SOCAT data providers. The researchers contact the three data providers at an early stage in the research and ask if they are interested in a collaboration which may eventually lead to co-authorship on a publication.

- **Outcome 1)** The data providers like the idea and all contribute their expert knowledge on the carbon cycle in the West Sea to the research and become a co-author on a joint publication. The research team cites the relevant SOCAT data product and methods paper(s) publication in their publication.
- **Outcome 2)** The data providers do not contribute to the research and do not become co-authors on the publication. The research team references relevant publications by the data providers and the relevant SOCAT data product and methods paper(s) in their publication.

**A global study** of long-term trends of surface water $fCO_2$ in the global oceans for the years 1990 to 2023 using SOCAT version 2024. The $fCO_2$ data have has been collected by all ~100 SOCAT data providers. The researchers contact very large data providers and a scientist active in SOCAT synthesis at an early stage in the research and ask if they are interested in a collaboration which may eventually lead to co-authorship on a publication.

- **Outcome 1)** The large data providers and the SOCAT scientist like the idea and all contribute their expert knowledge on the carbon cycle to the research and become a co-author on a joint publication. The research team cites relevant publications by other data providers and the relevant SOCAT data product and methods paper(s) in their publication.
- **Outcome 2)** The large data providers and the SOCAT scientist do not contribute to the research in any way and do not become co-authors on the publication. The research team references relevant publications by several data providers, as well as the relevant SOCAT data product and methods paper(s) in their publication.