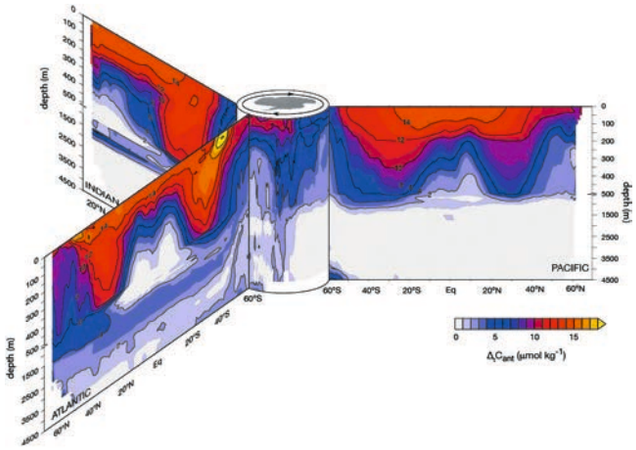
CENTER FOR CLIMATE SYSTEMS MODELING

SCIENCE HIGHLIGHTS FROM C2SM

TEXT: CHRISTINA SCHNADT POBERAJ, DOMINIK BRUNNER, NICOLAS GRUBER

Global carbon cycle: Two recent studies reveal new insights into the fate of man-made CO_2 from its emission to its removal by the ocean.



PAPER: THE OCEANIC SINK FOR ANTHROPOGENIC CO_2 FROM 1994 TO 2007

An international research project led by Professor Nicolas Gruber from ETH Zurich has determined the amount of man-made CO_2 emissions taken up by the ocean between 1994 and 2007.

Using observations from more than 50 cruises conducted across all ocean basins since 2003 and contrasting them to observations from the previous decades, Gruber et al. (2019) estimated that the ocean has taken up about 34 billions of metric tonnes of man-made carbon between 1994 to 2007. This means that the ocean has taken up nearly a third of all CO_2 emitted by human activities during this period. This percentage of CO_2 has remained relatively stable compared to the preceding 200 years, but the absolute quantity has increased substantially. This is because as long as the atmospheric concentration of CO_2 rises, the oceanic sink strengthens more or less proportionally. ■

REFERENCE

Gruber N et al. (2019) **The oceanic sink for anthropogenic CO_2 from 1994 to 2007.** Science, doi: 10.1126/science.aau5153.

PAPER: THE IMPORTANCE OF VERTICAL DISTRIBUTION OF EMISSIONS IN ATMOSPHERIC CO_2 SIMULATIONS

Atmospheric transport simulations are increasingly being used to estimate anthropogenic greenhouse gas emissions from atmospheric observations. Such estimates can be used to verify officially reported emissions and help countries track progress towards their emission reduction targets. A recent study indicates that current atmospheric transport simulations of CO_2 could be substantially biased because they do not properly consider the altitude at which CO_2 is emitted into the atmosphere. Releasing emissions at the correct altitude is critical because more than 50 percent of CO_2 in Europe is emitted from large point sources such as power plants and industrial facilities through stacks and cooling towers. By conducting high-resolution CO_2 simulations using an extended version of the mesoscale Consortium for Small-scale Modeling model COSMO, the authors demonstrate that near-surface concentrations are substantially overestimated when all CO_2 is released at the surface as is common practice in current models. They strongly recommend the representation of CO_2 emissions in all three dimensions in order to reduce model biases and to achieve the accuracy that is needed for independent emission verification. ■

REFERENCE

Brunner D et al. (2019) **Accounting for the vertical distribution of emissions in atmospheric CO_2 simulations.** Atmos Chem Phys, doi: 10.5194/acp-19-4541-2019.

ETH-KLIMARUNDE 2019 – SAVE THE DATE

This year's «ETH-Klimarunde» will take place at ETH on Wednesday, 23 October 2019, and will cover the theme «Climate change in mountain regions». Please save the date in your agendas!

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