Surface Ocean CO_2 Observing Network: New Technology for Ocean Extremes

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Technology Development Collaborators:
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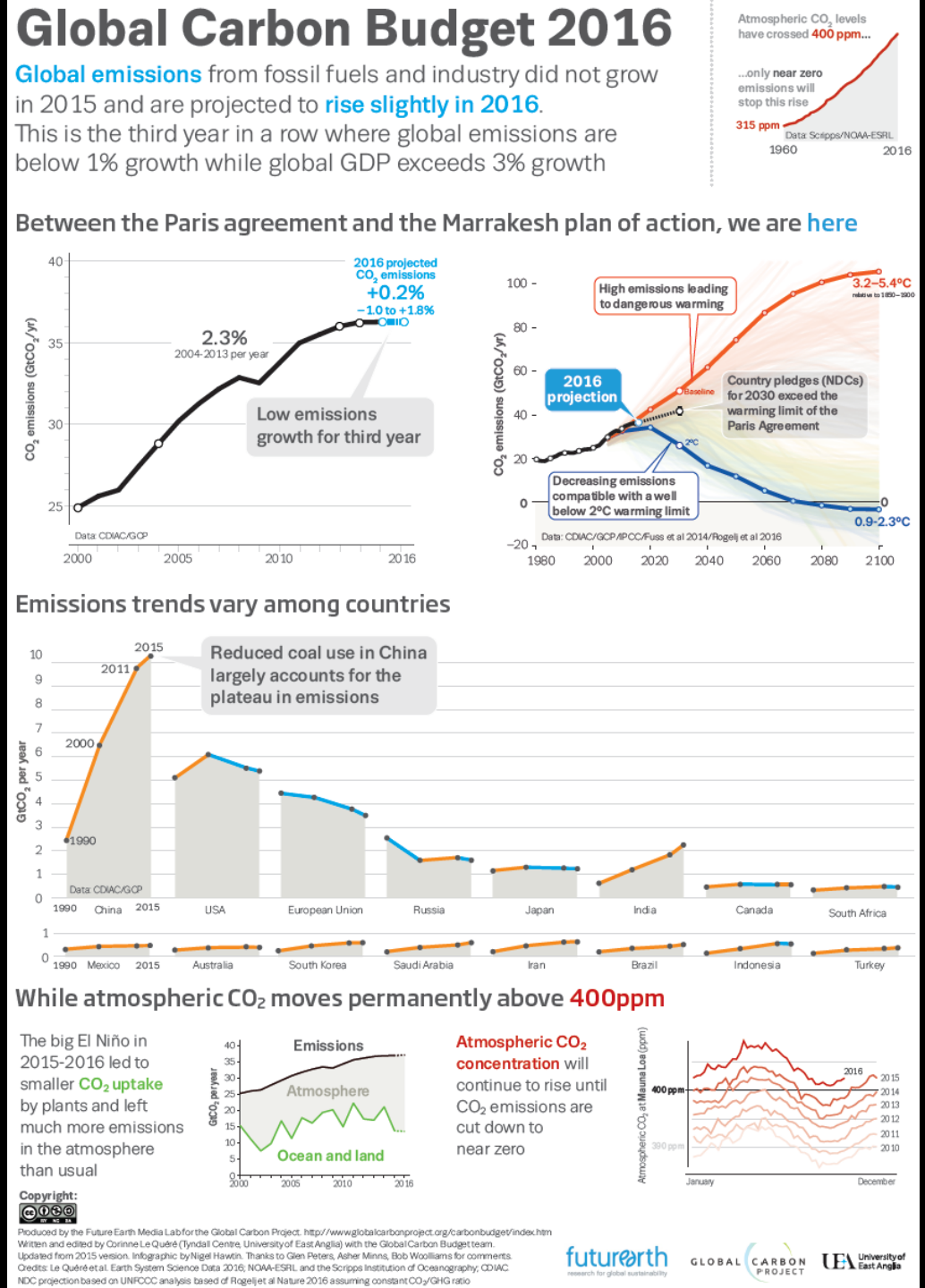
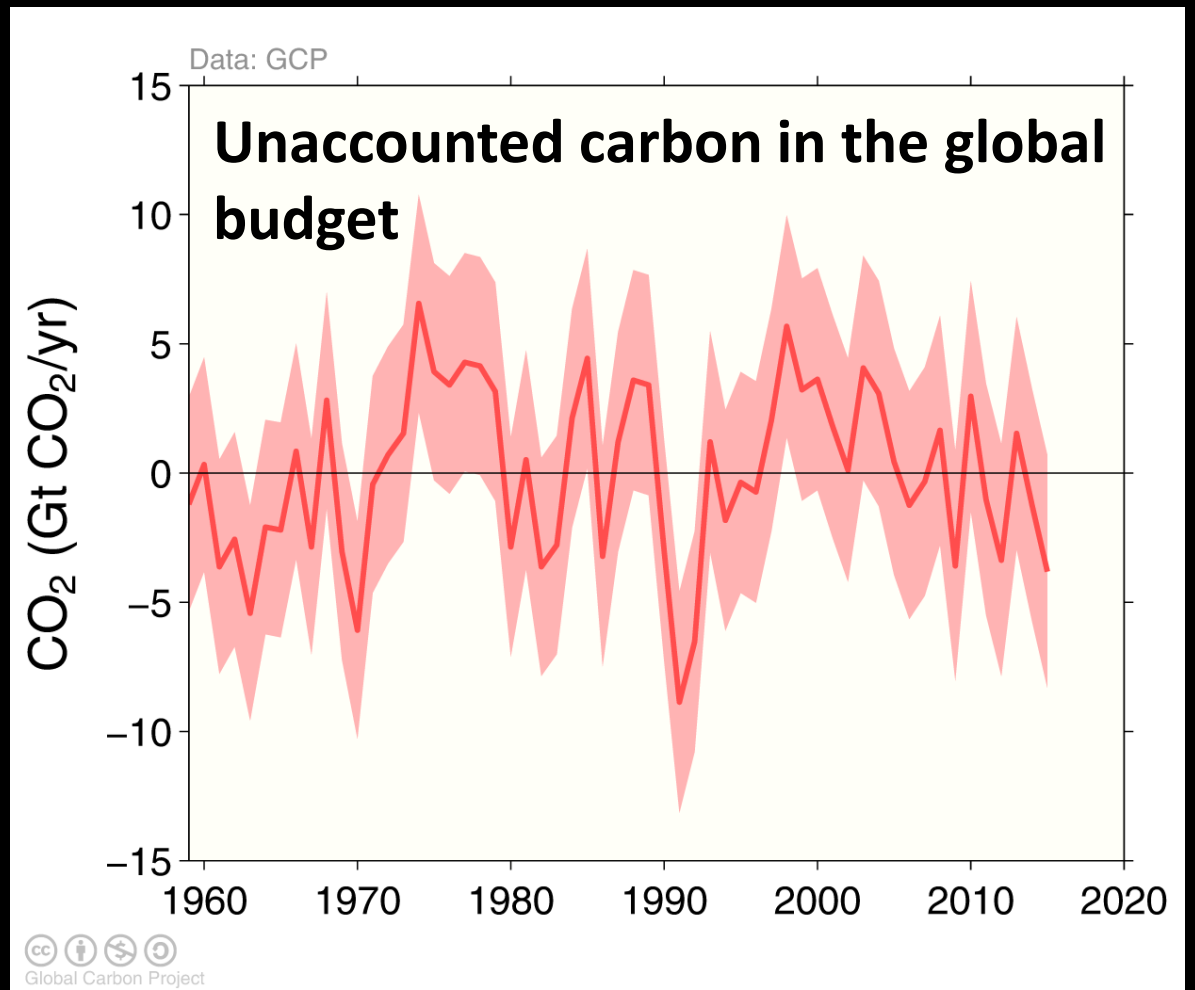
Societal relevance

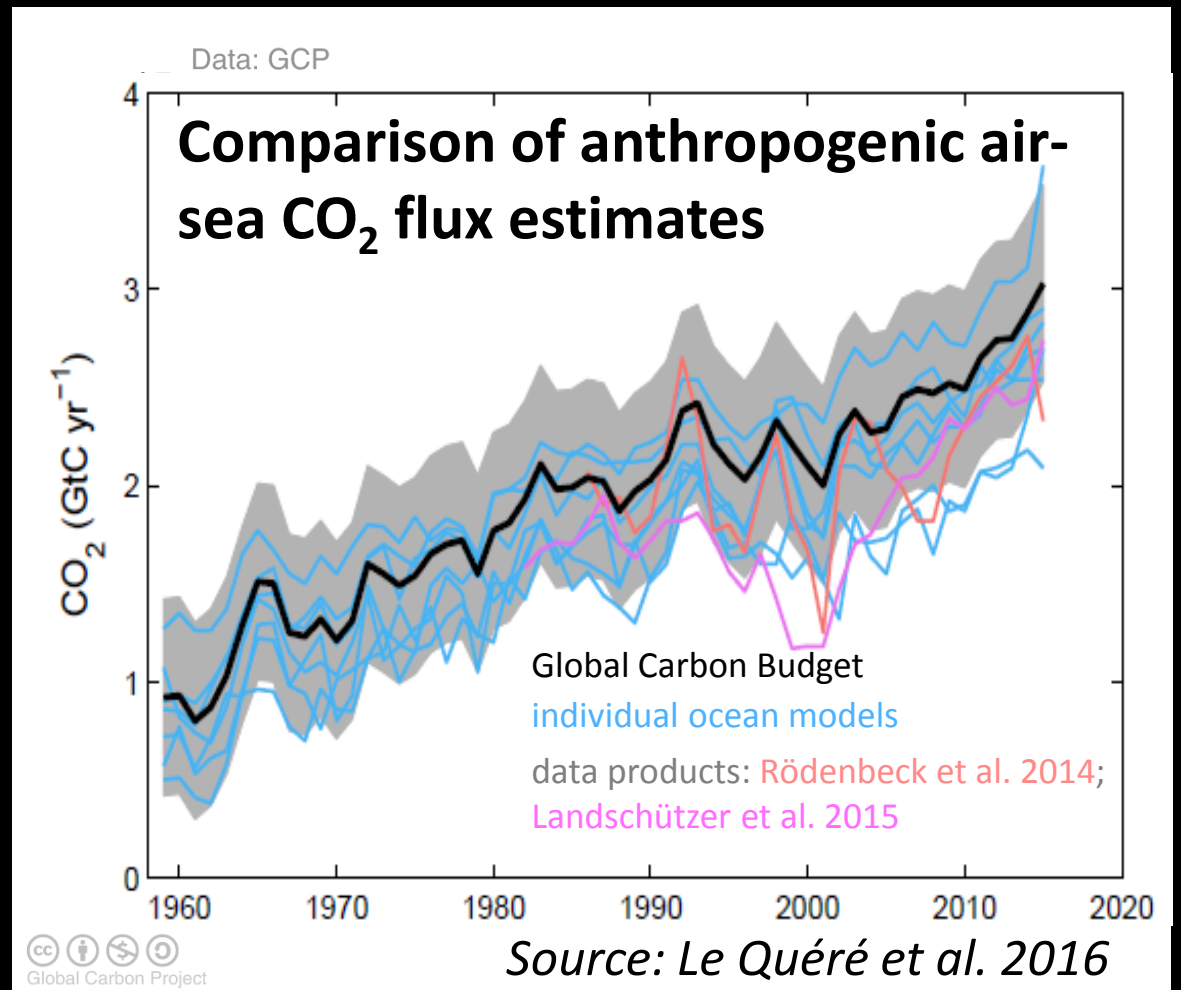
Goal: develop a complete picture of the global carbon cycle, including both its biophysical and human dimensions together with the interactions and feedbacks between them



Societal relevance

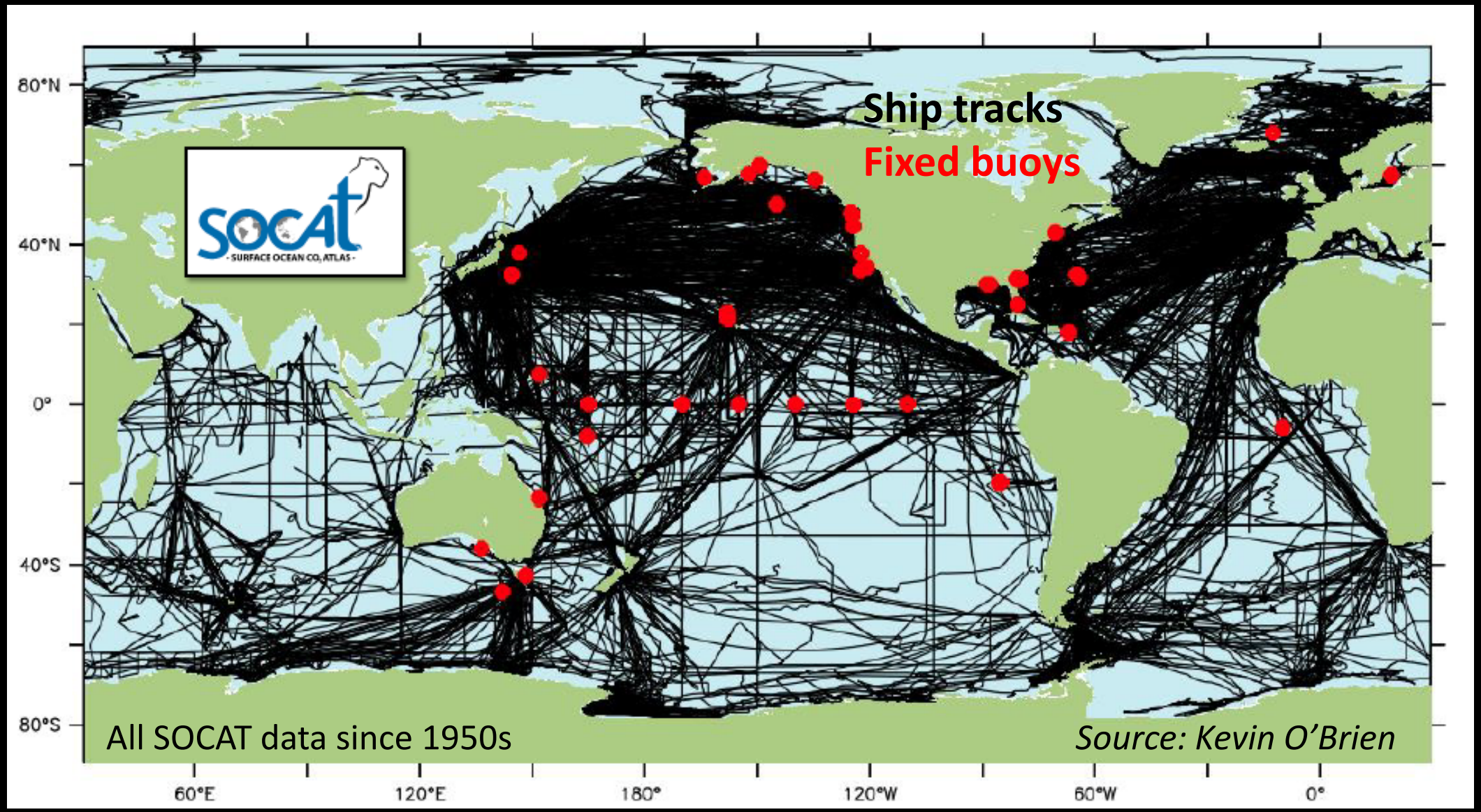
Large uncertainties in the global carbon balance remain and hinder independent verification of reported CO_2 emissions



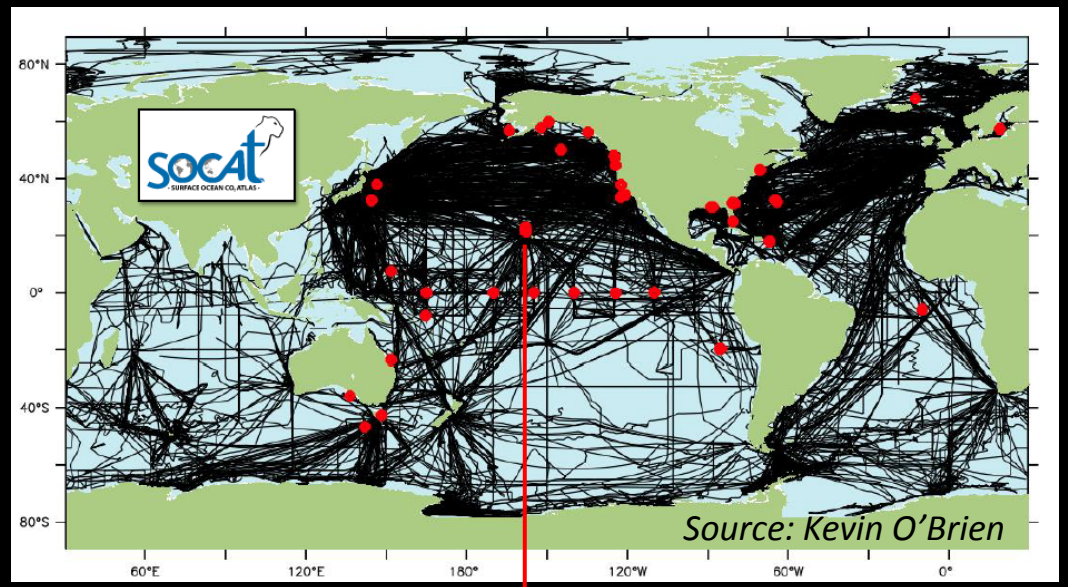


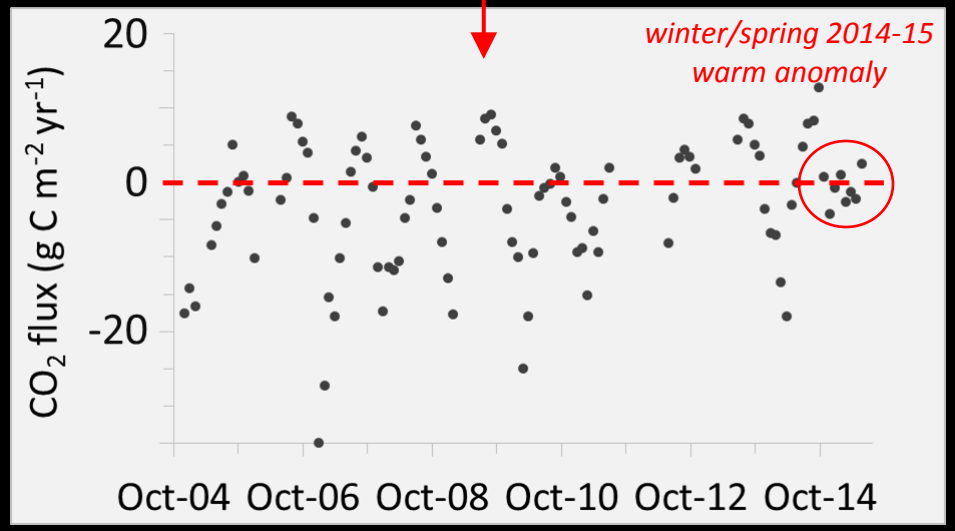
Source: Le Quéré et al. 2016

Observing challenges



Observing ~~challenges~~ opportunities





Source: Sutton et al. in review

The observing network works:

Both technologies are climate-quality measurements

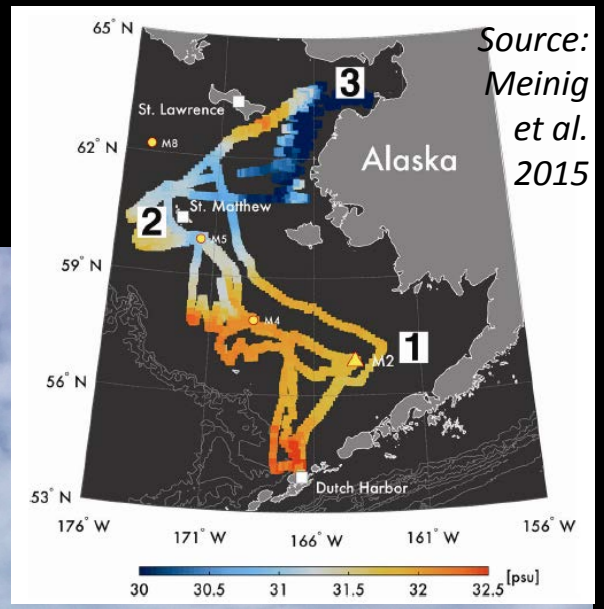
Over the last 15 years, air-sea CO_2 flux uncertainty has been reduced by 50%

New fixed time series resolve sub-seasonal variability and processes

New technology

Large payload for observing air/sea and phys/chem/bio parameters

Adaptive sampling capability convenient for observing ocean extremes (e.g., sea ice melt, marine heat waves, ENSO)



Photos courtesy of: Saildrone and Noah Lawrence-Slavas

New technology

Autonomous Surface Vehicle CO_2 ($ASVCO_2$) system

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New technology

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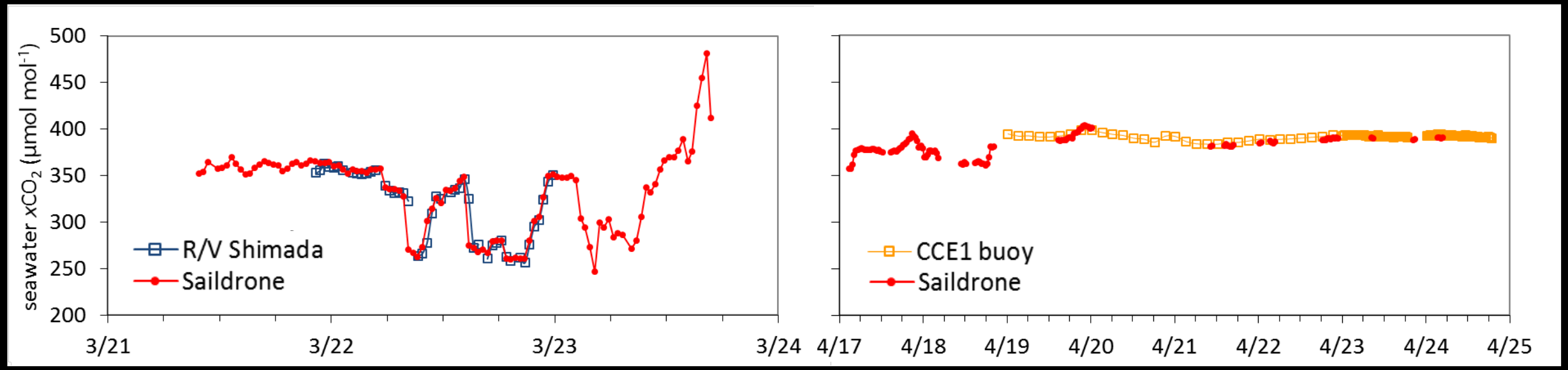
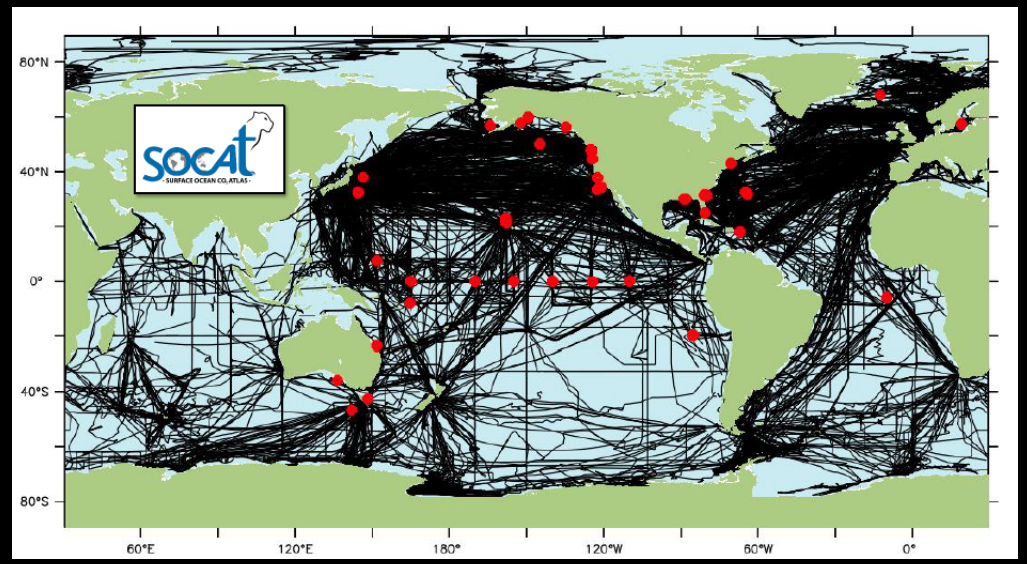
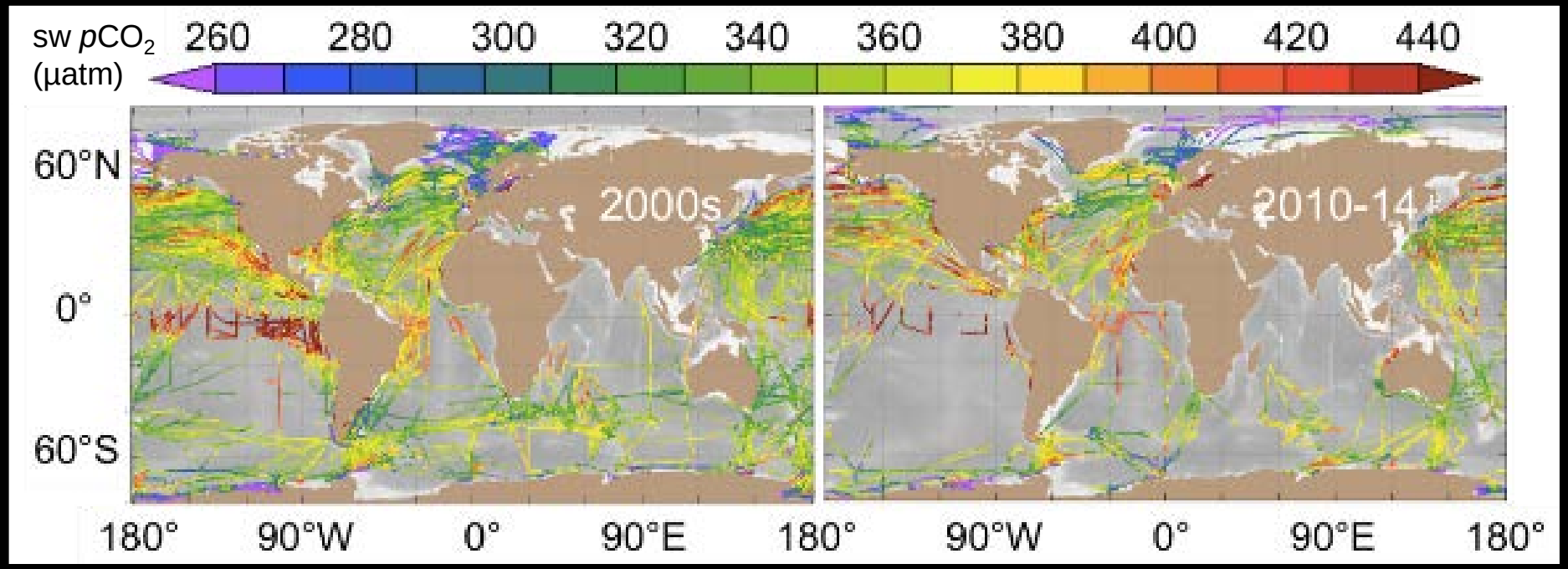


Preliminary comparisons show underway, moored, and ASV CO_2 are within 3 µatm (our goal is < 2)

New technology

Tropical Pacific missions 2017-2018:

ENSO, TIWs

Intercomparisons w/other platforms

Application to TPOS2020 design