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Constraining 20th-century sea-level rise in the South Atlantic Ocean

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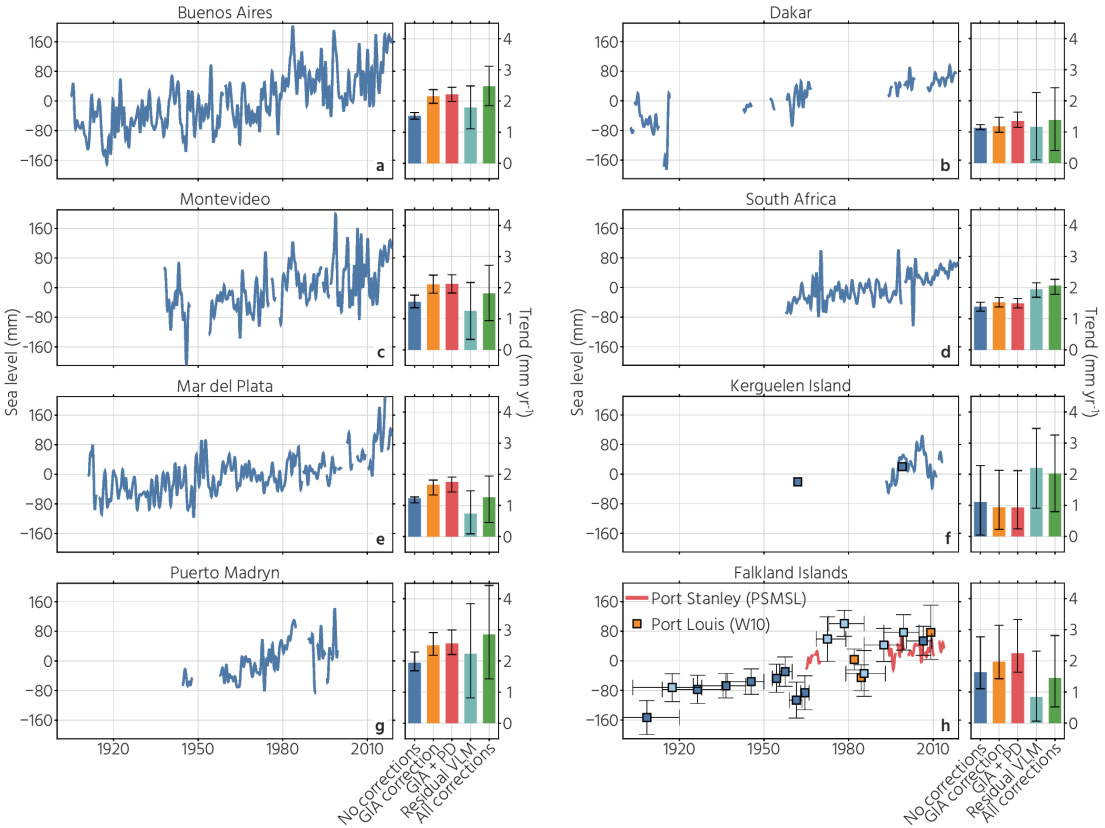

Figure. Observed sea-level changes in the South Atlantic ocean. Panel b shows the rescued records from Dakar and panel h shows the new salt-marsh reconstruction from the Falklands. The bar plots show the sea-level trends using various corrections for geophysical processes that cause local deviations from large-scale sea-level changes.

Frederikse et al. Constraining 20th-century sea-level rise in the South Atlantic Ocean *Journal of Geophysical Research – Oceans* https://doi.org/10.1029/2020JC016970

This work has been supported by the NASA Sea Level Change Science Team (Nadya Vinogradova-Shiffer)

Science question

Because of the low number of observations, estimates of the 20th-century sea-level rise in the South Atlantic Ocean are uncertain. Can we use geodetic observations of land motion, rescued tide-gauge observations, and sea-level reconstructions from salt-marsh samples to better constrain 20th-century sea-level changes?

Data and results

A tide-gauge data rescue effort has uncovered historic data from Dakar, Senegal, which now provides the longest known instrumental sea-level record from the African continent.

By dating microfossils in the Swan Inlet salt marsh on the Falkland Islands, a high-resolution sea-level reconstruction spanning the last 2000 years has been produced. Due to the exceptional high temporal resolution, we were able to use this reconstruction to estimate 20th-century sea-level changes from this reconstruction.

We combine sea-level observations with GPS measurements and geophysical models constrained by GRACE observations to account for local effects, such as glacial isostatic adjustment and vertical land motion.

Significance

Over the 20th century, sea level in the South Atlantic Ocean has risen slightly faster than the global mean. This above-average rise is due to heat accumulation in the Atlantic Ocean and the above-average impact of ice melt on the South Atlantic Ocean.

These results help us to better understand past global and regional sea-level changes and their causes. This understanding is crucial to improve sea-level projections.