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## New insights into the ice-covered Southern Ocean circulation from multi-altimeter combination.

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Subtle changes in the Southern Ocean subpolar ocean circulation patterns can lead to major changes in the global overturning circulation, as well as for floating ice-shelves with critical implications for global sea-level. It is therefore crucial to carefully understand Antarctic polar ocean circulation, but the lack of ocean observation has considerably blocked our advance in this field in the past.

In this study we benefit from a new high-resolution Sea Level Anomaly (SLA) product that has been specifically constructed to document sea-level in the ice-covered Southern Ocean. This product combines up to 3 satellite altimetry missions to map SLA data daily on an equal-area grid, including the ice-covered areas of the ocean from 2013 to 2019.

Results suggest that we can map ocean features with unprecedented resolution for the region. We characterize the main features of the subpolar Southern Ocean SLA and circulation seasonal cycle, being composed of three main modes of variability, significantly impacting the dynamics of the region. We explore how they are linked with atmospheric and sea-ice forcings. Dynamics at smaller scales are investigated, by identifying the properties of mesoscale variability where possible.