

# How Has the Ferrel Cell Contributed to the Maintenance of Antarctic Sea Ice at Low Levels from 2016 to 2022?

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This study investigates the specific circulation anomalies that have sustained the low Antarctic sea ice state since 2016. Firstly, we find a significant strengthening and southward shift in the Ferrel Cell (FC) during 2016–2022, resulting in a marked increase in southward transport of heat and moisture. Secondly, this enhanced FC is closely associated with a stronger circumpolar wave pattern over the same period. This pattern is zonally asymmetric and greatly amplifies the poleward advections of heat and moisture, leading to the increased downward longwave radiation, more liquid precipitation and sea ice retreat in specific regions, including the western Pacific and Indian Ocean sectors, eastern Ross and northern Weddell Seas. The mechanism deduced from the short-term period is further supported by the results of 40 ensemble members of simulations. The southward expansion of the FC is closely linked to La Niña-like conditions but may also be influenced by anthropogenic global warming.

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