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Mechanical versus Thermodynamical theories of the Drake Passage Effect

Remi Tailleux
University of Reading, Department of Meteorology, United Kingdom [r.g.j.tailleux@reading.ac.uk]

The Drake passage effect refers to the apparent control of the meridional overturning circulation (MOC) by the southern winds at the latitude of Drake passage. A popular interpretation is that the effect occurs because the northward Ekman transport induced by the southern winds needs to be returned below a certain depth where it can lock on to the southward deep branch of the MOC. Such an idea has been widely interpreted as supporting the idea that the MOC is mechanically-driven rather than buoyancy-driven. The purpose of this work will be to review the current interpretations of the Drake passage both in terms of mechanical and thermodynamical theories. It will be argued that the current balance of evidence suggests that the Drake passage effect fits naturally within the classical buoyancy-driven view of the MOC as revisited recently by the author to take into account the role of mechanical forcing in an energetically consistent way.