# Article information:

Slippery Bottom Boundary Layers: The Loss of Energy From the General Circulation by Bottom Drag - Ruan - 2021 - Geophysical Research Letters - Wiley Online Library  
<https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2021GL094434>

# Article summary:

1. The ocean circulation is energized by external forcing, with wind work on the geostrophic flow contributing to the mechanical energy input into the general circulation.

2. Bottom drag, which involves flow over bottom topography, is a prominent mechanism for removing kinetic energy from the ocean circulation.

3. Previous estimates of bottom drag's contribution to the ocean energy budget may be significantly biased due to unresolved bottom boundary layer processes, such as Ekman buoyancy arrest and reductions in bottom velocities.

# Article rating:

Appears moderately imbalanced: The article provides some useful information, but is missing several important points or pieces of evidence that would be required to present the discussed topics in a balanced and reliable way. You are encouraged to seek a more balanced perspective on the presented issues by exploring the provided research topics and looking at different information sources.

# Article analysis:

The article titled "Slippery Bottom Boundary Layers: The Loss of Energy From the General Circulation by Bottom Drag" discusses the role of bottom drag in removing kinetic energy from the ocean circulation. The authors highlight the importance of understanding this process for accurately estimating the ocean's energy budget and its impact on mesoscale eddies.

The article begins by acknowledging that identifying the mechanisms through which kinetic energy is dissipated in the ocean remains a challenge in oceanography. It mentions several potential mechanisms, including bottom drag, generation and breaking of internal waves, and submesoscale instabilities. However, the focus of this manuscript is on bottom drag as a mechanism for energy loss.

The authors note that previous estimates of bottom drag's contribution to the ocean energy budget may be biased due to unresolved processes in the bottom boundary layer (BBL). They argue that neglecting the vertical structure of the BBL can lead to significant underestimation of bottom drag dissipation. They propose using a high-resolution numerical model to quantify how shear in the BBL reduces kinetic energy dissipation.

The article provides a detailed explanation of bottom stress and its calculation using empirical quadratic drag laws. It also discusses potential sources of error in previous estimates, such as difficulties in distinguishing between total low-passed flow and its geostrophic component, and assumptions about estimating velocity shear away from the bottom.

While the article presents an interesting perspective on the role of bottom drag in energy dissipation, there are some limitations and biases that should be considered.

Firstly, the article focuses primarily on one mechanism for energy loss (bottom drag) while briefly mentioning other potential mechanisms. This could lead to an incomplete understanding of overall energy dissipation processes in the ocean.

Secondly, although the authors acknowledge uncertainties and limitations in previous estimates, they do not provide a comprehensive analysis or critique of these estimates. This lack of critical evaluation leaves room for interpretation and potential bias towards their own findings.

Additionally, the article does not explore potential counterarguments or alternative explanations for the observed phenomena. This could limit the reader's ability to fully evaluate the validity and significance of the authors' claims.

Furthermore, the article does not provide a balanced discussion of potential risks or drawbacks associated with bottom drag. It primarily focuses on its role in energy dissipation without considering any negative impacts it may have on marine ecosystems or other aspects of ocean dynamics.

Overall, while the article presents interesting findings regarding bottom drag and its impact on energy dissipation in the ocean, it has some limitations in terms of bias, incomplete analysis, and lack of consideration for alternative perspectives. Further research and critical evaluation are needed to fully understand the complex processes involved in ocean energy dissipation.

# Topics for further research:

* Mechanisms of kinetic energy dissipation in the ocean
* Role of internal waves in energy loss in the ocean
* Submesoscale instabilities and their contribution to energy dissipation
* Critique of previous estimates of bottom drag's contribution to the ocean energy budget
* Alternative explanations for energy dissipation processes in the ocean
* Negative impacts of bottom drag on marine ecosystems and ocean dynamics

# Report location:

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