Scaling properties of heat transport in idealized planetary atmospheres and oceans

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The meridionally inhomogeneous heating of planetary atmospheres and oceans induces turbulent flows through the baroclinic instability mechanism. This phenomenon greatly enhances the heat transport between the equator and the poles and needs to be properly parameterized in global climate models. Using the canonical two-layer quasi-geostrophic model, we augment a recently proposed scaling theory [1,2,3] to describe the strongly turbulent very-low-drag regime with arbitrary density stratification. The augmented theory is based on an asymptotic remapping of the equations, which leads to quantitative predictions with no additional fitting parameters.

References

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