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Super-Reflection in Fluid Discs DAVID TSANG, DONG LAI, Cornell University — In differentially rotating discs with no self-gravity, density waves cannot propagate around the corotation, where the wave pattern rotation speed equals the fluid rotation rate. Waves incident upon the corotation barrier may be super-reflected (commonly referred to as corotation amplifier), but the reflection can be strongly affected by wave absorptions at the corotation resonance/singularity. The sign of the absorption is related to the Rossby wave zone very near the corotation radius. We derive the explicit expressions for the complex reflection and transmission coefficients, taking into account wave absorption at the corotation resonance. We show that depending on the sign of the gradient of the specific vorticity of the disc, $\zeta = \kappa^2/(2\Omega\Sigma)$ (where Ω is the rotation rate, κ is the epicyclic frequency, and Σ is the surface density), the corotation resonance can either enhance or diminish the super-reflectivity, and this can be understood in terms of the location of the Rossby wave zone relative to the corotation radius. Our results provide the explicit conditions (in terms of disc thickness, rotation profile and specific vorticity gradient) for which super-reflection can be achieved. Global overstable disc modes may be possible for discs with super-reflection at the corotation barrier.

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