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Instability associated baroclinic critical layers in rotating stratified shear flow CHEN WANG, NEIL BALMFORTH, University of British Columbia — When a vertically stratified fluid is subject to horizontal shear, a baroclinic critical layer of internal gravity waves can appear. It is where the wave's intrinsic frequency matches the fluid's buoyancy frequency and the baroclinicity becomes singular. The present research studies baroclinic critical layers associated with normal mode instability. The baroclinic critical layer makes localized large wave amplitude and abrupt phase change, as well as strong wave-mean interaction and specially, it can make the flow unstable. In strong-stratification flows, the baroclinic critical layer connects an incident inertial-gravity travelling wave to an exponentially decaying amplitude, and in weak-stratification flows, it connects a Kelvin wave to a standing inertial-gravity wave. Moving the baroclinic critical layer into the domain will either make the originally neutral mode unstable or destroy that mode. We have specified the conditions of these two situations according to the conservation of pseudomomentum. The instability induced by baroclinic critical layer is very different from the previous known strato-rotational instability (SRI): it is unstable for a continuous band of wavenumbers since resonance condition is not required.

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