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# Large scale baroclinic instability of the mean oceanic circulation: a local approach

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Large scale baroclinic instability is investigated as a potential source of Rossby waves and large scale variability in the ocean.
This baroclinic instability is first reviewed in a two and a half layer model. As already noticed by several authors, the instability arises in westward surface mean flow when the phase velocities of the two vertical modes are made equal by mean flow influence. This large scale instability is stronger at low latitudes and thus is likely to happen in the westward return flow of the subtropical gyres. Further investigations with a continuous stratification quasi-geostrophic model show that the instability is stronger where the mean flow projects negatively on the second baroclinic mode (imposing positive vertical modes at the surface). The linear stability calculation is then performed on ARGO derived mean flow along with mean stratification data. The results show that the unstable regions are situated at low latitudes in every oceanic basin, in Western boundary currents and in some part of the Antarctic Circumpolar Current. The location of these unstable regions is well correlated with the region of negative projection of the mean flow on the second baroclinic mode. Given that the unstable mode growth times are generally smaller than six months at low latitudes, these unstable modes are likely to be observable in satellite altimetry. Therefore, results of the present article suggest that the large scale instability is indeed a source of large scale variability at low latitudes.