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Waveguide for Rossby waves in the Antarctic Circumpolar current based on the altimetry data

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Rossby waves in the ocean play a crucial role in large-scale ocean circulation and global climate. However, the interaction of Rossby waves with large-scale currents in the ocean is still a relatively little studied issue. The Antarctic Circumpolar Current (ACC) is the largest ocean current in the World Ocean. The ACC is a waveguide for Rossby waves where wave kinetic energy is captured by jets, and where Rossby waves interact with the flow. The purpose of this research is to analyze a manifestation of Rossby waves in the ACC based on satellite altimetry data. We propose a new approach to determining the boundaries of the waveguide. We analyze the variability of sea level anomalies and examine the latitude where the zonal velocity of Rossby waves is zero. For calculating Rossby waves velocities we use Radon and cross-correlation methods. We detect the Northern and the Southern Waveguide Boundaries for the ACC and compare them to the climatological fronts in the ACC. The linear theory of Rossby waves doesn't work within the waveguide due to that we should consider nonlinear in the long-wave approximation. It follows from the theory of shallow water that nonlinearity in the long-wave approximation compensates exactly for the Doppler shift. The nonlinear dispersion equation agrees well with altimetry data.

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