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Deep Thermal Front (southeastern Brazilian coast) see through acoustics: a preliminary study from an operational oceanography perspective

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The continental shelf region off the southeastern Brazilian coast (between 20°S and 28°S) is characterized by intrusions of the relatively cold and fertile South Atlantic Central Water (SACW) from the open ocean. Prediction and monitoring of this water mass are topics of great interest given its importance, for example, on climate, carbon cycle, fishing, mariculture, nutrients and pollutants dispersion, and for the oil industry. The intersection of the 18°C isotherm with the seafloor is appointed in the literature as a good tracer for SACW presence on the continental shelf and also to characterize the Deep Thermal Front (DTF) [Castro, 1996]. Among different factors that drive the SACW penetration on the continental shelf, one prominent mechanism is the water transport driven by the conditions of NE-E wind forcing. These winds varies seasonally, and they are prevalent during the spring and summer months. During these months, the water column is generally stratified due the combined effects of solar heating and DTF presence. In contrast, the reverse effect is characteristic in winter, when the water column is nearly homogeneous, relatively colder on the surface and relatively warm close to the bottom. Consequently, the sound speed field changes and thus the acoustic rays are propagated with different characteristics depending on presence, absence or DTF position. Considering this information, acoustics may provide an additional source of data that supplements the other conventional methods (e.g., hydrographic moorings and cruises, buoys, gliders, and others) for tracking and monitoring the front movement. In addition, it is worth emphasizing that acoustic methods present one interesting advantage in that they are able to sample the water column over large three-dimensional distances on an effectively synoptic scale. In this paper, a preliminary study of acoustic propagation modelling through one vertical section off the Brazilian southeastern coast at Cananéia region (state of São Paulo) is presented. Theorical temperature and salinity fields with differents conditions of DTF position are used for the calculations. Notable variations in the transmission loss field, rays propagations and time arrivals are found when the DTF is moving. These results support the idea that acoustics can be an interesting tool in monitoring and tracking of DTF movement, especially in the context of an intregrated program of observational oceanography and numerical ocean modeling.