Monitoring the northern limb of the subtropical gyre with high-resolution XBT surveys in the South Pacific Ocean

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Because South Pacific thermocline waters transit through the Coral Sea from the subtropical gyre toward the equator, their properties are of great importance to global and regional climate variability. The water pathways however remain poorly documented. As a part of the ongoing Southwest Pacific Ocean circulation and Climate Experiment (SPICE) project, the IRD team from Noumea started a bi-annual XBT survey between New Caledonia, the Vanuatu archipelago and Solomon Islands. Since mid-2008, seven surveys were operated with typical drop operated every 1h30 on average. The XBT probes used in this project sample nominally down to 800 m for most of the types, reaching 2000 m for the specific T5-type. Preliminary analyses show that the fine structure of the North Vanuatu Jet is complex and results in narrow paths resulting from deflection by the Banks Islands and Santo. Locally the presence of eastward flows is attributable to small-scale structure in the wind mainly resulting from the Santo island wake effect. The distinct westward jets are consistently found at different longitudes throughout the eastern Coral Sea and, throughout the year. In contrast, the eastward counter currents exhibit a strong seasonal variability. Monitoring the flow between the Vanuatu and New Caledonia will require a dedicated effort if an accurate estimation of the total mass transport is desired. The nature and the deep vertical scale of this portion of the flow represent a challenge for in situ observational program, and these points plead for using deep probes like T5-type. Monitoring the upper density field and resulting geostrophic current flowing into the Coral Sea provides important information about the Coral Sea/Solomon Sea circulation system, particularly on the nature of the flow that subsequently crosses the Solomon Sea and eventually feeds the Equatorial Pacific Ocean. As a follow-up of earlier exploratory hydrographic surveys, the present XBT/Argo repeated surveys provide a new, important element of the Coral Sea monitoring system as planned by the CLIVAR/SPICE implementation plan.