

THE HYDROGRAPHIC STRUCTURE OF THE ALBORAN SEA GYRE,
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Summary Comparisons between hydrographic observations obtained during Donde Va? (June and October 1982) to those obtained in 1962 (Lanoix, 1974) show that the earlier gyre was larger and more intense.

Resume: Des mesures hydrologiques ont été effectuées pendant juin et octobre 1982 dans la mer d'Alboran par l'équipe Donde Va. Le tourbillon anticyclonique de 1982 fut plus petit et plus faible que le tourbillon de 1962 (Lanoix, 1974).

In 1982 we did two CTD surveys of the western Alboran Sea as part of the Donde Va? experiment (Donde Va Group, 1984; Parrilla, 1984). A rapid two-ship survey during 5-13 October encompassed the entire western Alboran, and a single-ship survey during 22-30 June covered the northern half only.

We use the hydrographic distributions and geostrophic calculations to compare the gyre found in 1982 to that present during summer 1962. Lanoix (1974) used data gathered by four ships during 15 July-15 August 1962 to comprehensively describe the anticyclonic gyre which is formed by the inflowing Atlantic Water. The summer 1962 and October 1982 surveys are the two best realizations of the gyre to date. This gyre is always present, but its size and location vary (Parrilla and Kinder, 1984).

We used two working definitions for the gyre boundary. Both the 15 dyn cm (1.5 J/kg) contour on the 0/200 dbar dynamic topography and the 140 dbar isobar on the 37.5 isohaline distribution were closed isolines that appeared to separate the gyre from the inflowing Atlantic Current during both years.

The 1962 gyre was larger and stronger than the October 1982 gyre. In 1962 the center was about 14 km farther north ($35^{\circ}47'$), and the periphery about 20 km farther north ($36^{\circ}08'$) and 30 km farther east ($3^{\circ}20'$). This resulted in more than twice the surface area (11,000 vs 5,000 km²) and volume (1600 vs 700 km³) of Atlantic water (defined as salinity < 37.5). The 1962 gyre was also about 25 percent deeper (220 vs 174 m) and had a stronger dynamic high (33 vs 25 dyn cm). During October 1982 transport around the gyre (i.e., recirculation) was similar to the inflow (1.3 and 1.4×10^6 m³/sec), but in 1962 it was about 50 percent greater than the inflow (based on Lanoix Sections 8 and 9; 2.5 and 1.6×10^6 m³/sec).

The partial survey in June 1982 suggested that the gyre may have been larger than in October, although probably smaller than in 1962. The diminution may have occurred during a major episode of low eastward flow that appeared in current meter records north of $35^{\circ}58'N$ along $4^{\circ}45'W$ in mid-September (Kinder, 1984). During this episode the Atlantic inflow current was either absent or flowing farther south than where the gyre is normally found. To transform from a 1962-size gyre to an October 1982-size gyre over the ten day low-flow episode would require the gyre to lose about 1.1×10^6 m³/sec of water with salinity < 37.5, or about the normal eastward transport.

References

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