SEA SURFACE TEMPERATURES STUDIED BY METEOSAT DATA ALONG THE COAST OF SENEGAL AND MAURITANIA[1]

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Abstract: METEOSAT data in the thermal infra-red band have been processed over the coastal area of West Africa between Guinée-Bissau and Mauritania. The operating process used is a superposition of successive images obtained on one or several days; then a comparison of radiometric data allows the extraction of

For a suitable representation for the thermal mapping of the surface of the sea we classify all possible values (from 0 to 255) in different categories allowing the coupling of neighbouring values and getting a better contrast of isothermal contours. Giving a color code to each category, processed data are presented either on a printer, Benson plotter, or color-screen peripheral device (a PERICOLOR screen which allows the representation of a matrix of 256 x 256 pixels).

METEOSAT raw data have no information about radiometric or geographic calibration; the first point was established with sea-truth measurement and the second was adjusted either by South and East horizons or landmark.

4. RESULTS

The spreading of warm water over cold water is well defined during May-June 1978. Trade winds grow weaker and the thermal front is going towards the North (see Figure 2). It seems that this warming came from the South-West in agreement with Postel (1952) and Rossignol (1973). During the same period upwelling at Cap Timiris and Cap Blanc are going less active and disappear. On the shallow waters of the Banc d'Arguin there is also evidence of warming water.

Rossignol (1973) shows in May-June (Figure 1) an ideal view, similar to the evolution shown in Figure 2, where the intrusion of tropical water over cold water is visible. Sea truth measurements gained at the same time by merchant vessels (Figure 3) agree with our analysis.

During June-July 1978 similar observations were made and the thermal front was North of Cap Blanc.

Thus many particular features well known by oceanographers off the West African coast have been also recognised by remote sensing analysis.

With regard to the results of data processing, we want to draw attention to the similarity of two images; the first one (Figure 2, image 2) was processed over 6 days from 19 May to 3 June 1978, with a daily observation at 1.00 p.m.; the second one (Figure 4, image 15) was processed in the same manner with six observations during one day, the 31 May 1978. The thermal inertia of the ocean allows our data processing so long as clouds are moving.

5. SEASONAL MIGRATIONS OF FISH AND ASSISTANCE TO FISHERY MANAGEMENT

With the North South oscillation of the thermal front, where lay primary and secondary production, is associated the migration of pelagic schools (tuna, sardinella) or demersal fishes.

Species with "saharian affinity" (cold water) which stay North of Cap Blanc during August and October are moving South in November as far as the extent of upwelling water (Champagnat and Domain, 1978).

Species with "guinea affinity" (warm water) are moving less and make use of production issued of upwelling during the cold season, and the outfall of river during the warm season.

For pelagic fishes (tuna, sardinella, chinchard) the migrations follow seasonal variation of oceanic conditions and the displacement of the thermal front (Figure 5).

Another species, that of fishermen, sometimes shows the same synchronism linked this time to fish presence (Figure 6); the moving of fishery effort from Kayar to St. Louis is done simultaneously with the advance of the front. In front of St. Louis the quick shifting of the front explains the shortness of the fishery season.

Nevertheless, if the main features of this regional ecology are well defined some questions remain, like the short migrations of demersal fish in the Kayar hole - Cap Vert area, or like the fact that a part of the sardinella school stay North of 20°N during the cold season. Probably a reason will be the hydrological conditions.

Due to its large amount of data, remote sensing of the sea could be a help for obtaining a better knowledge of quick variations, which oceanographic cruises are unable to distinguish.

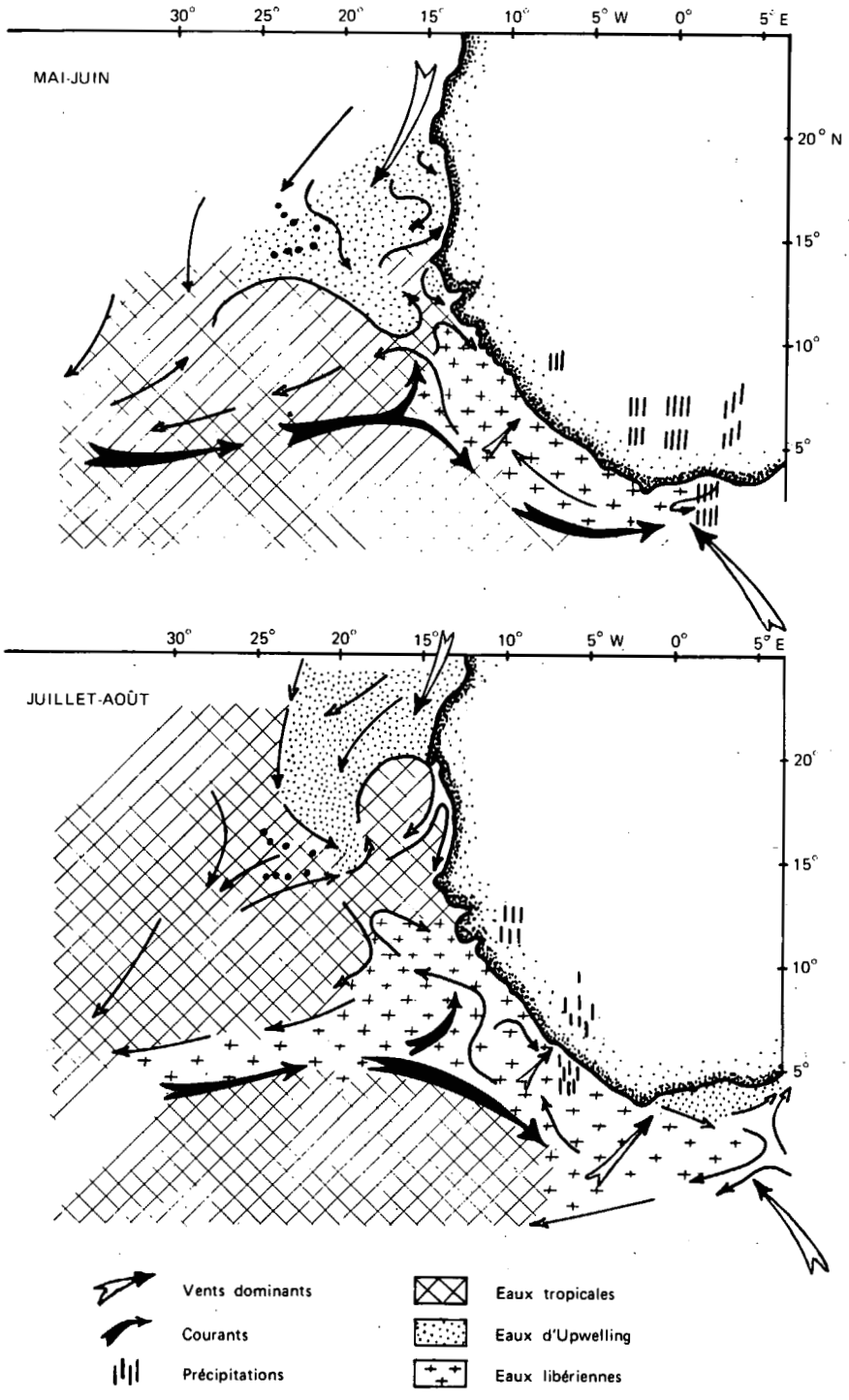
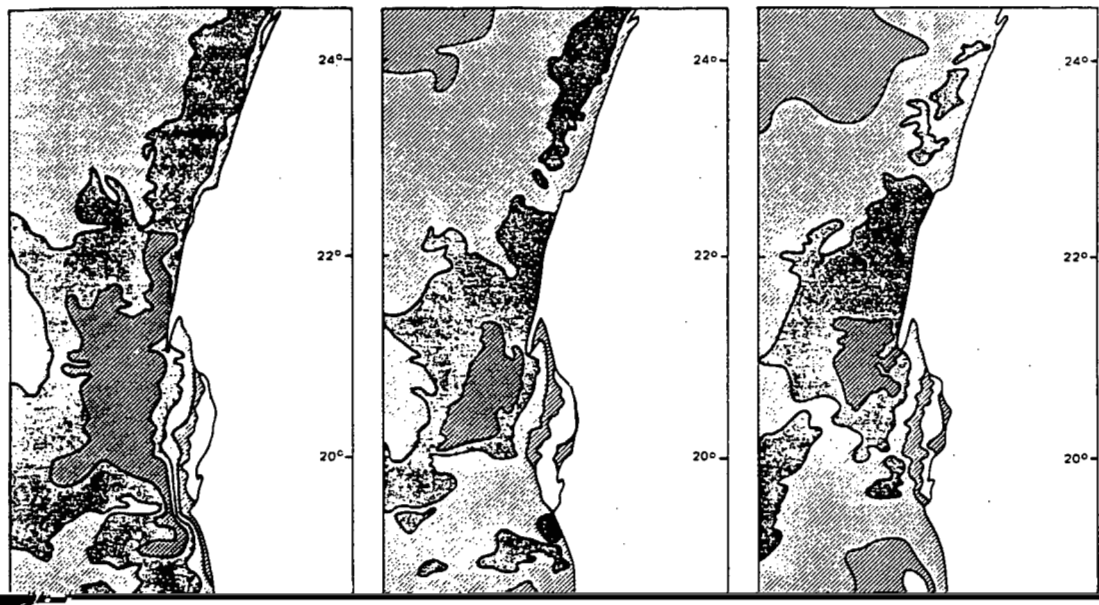


Figure 1. Evolution of different water masses appearing at the surface in the eastern Atlantic between the equator and 25°N from May to August (after Rossignol, 1973).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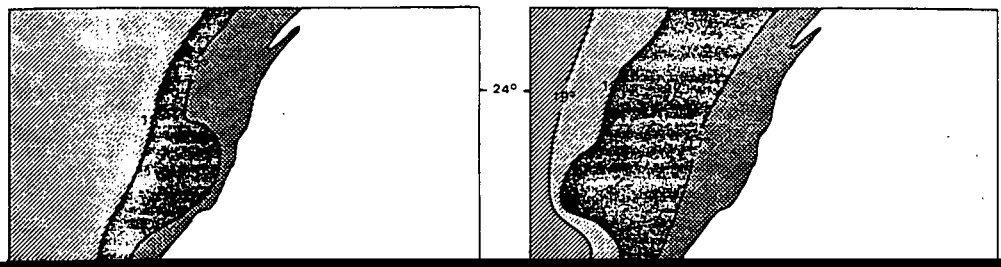
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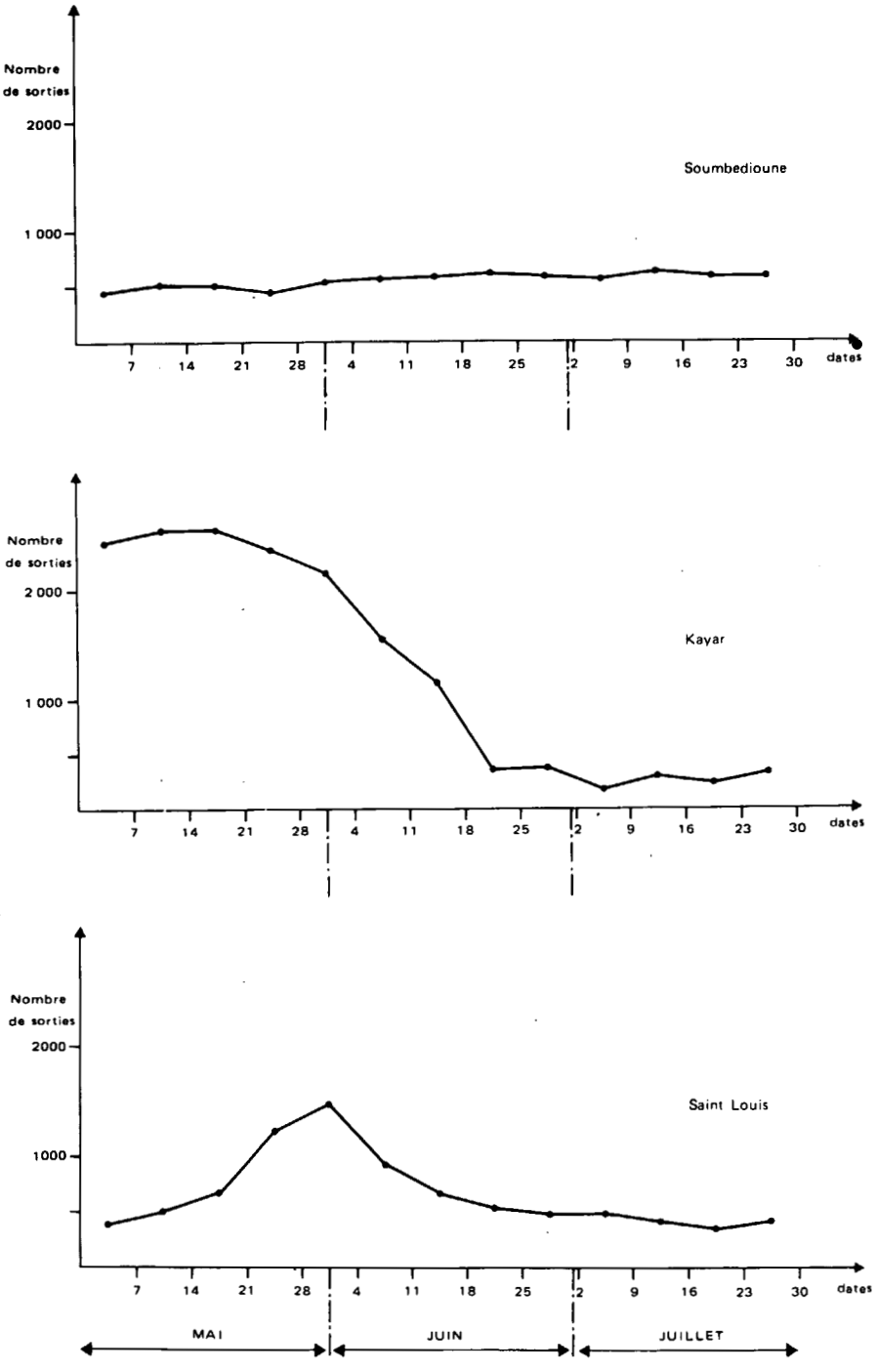

Figure 6. The evolution of fishery effort, in number of fishing pirogues by weeks from 1st May to 30th July 1978 in the harbours of Soumbedioune, Kayar and St. Louis.

When fish ecology is sufficiently well known, temperature maps may sometimes be converted to maps showing areas where fish are probably available. This information is useful for fishermen and trawlers and allows them to save time and achieve better management.

Based on this idea, an assistance to the French flotilla of trawlers on the West African coast was conducted last year, involving collaboration of the space agency, meteorological office, scientists and fishermen.

6. REFERENCES

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