

1. Algoa Bay Long Term Monitoring and Research Programme (Key collaborators: Elwandle and Egagasini but much collaboration from a variety of other institutes including HEI's, SAIAB, etc)

Algoa Bay has been chosen by SAEON as an 'ecosystem study area' and is a joint effort between the Elwandle and Egagasini Nodes, providing a complete interdisciplinary monitoring program to fully understand the region and the links between offshore and coastal waters. Dr Goschen is the principle investigator of the physical oceanography component, which supports the biological component, co-ordinated by Elwandle. One of the key driving objectives is to gain more knowledge on the ocean dynamics of the region, in particular the northern area of Algoa Bay where few measurements have taken place in the past and to understand how these dynamics are influenced by the Agulhas Current and how the circulation is changing with respect to global change (both climate variability and climate change). A number of instruments that measure physical variables have been deployed between Cape Recife and Port Alfred (Fig. 1.1).

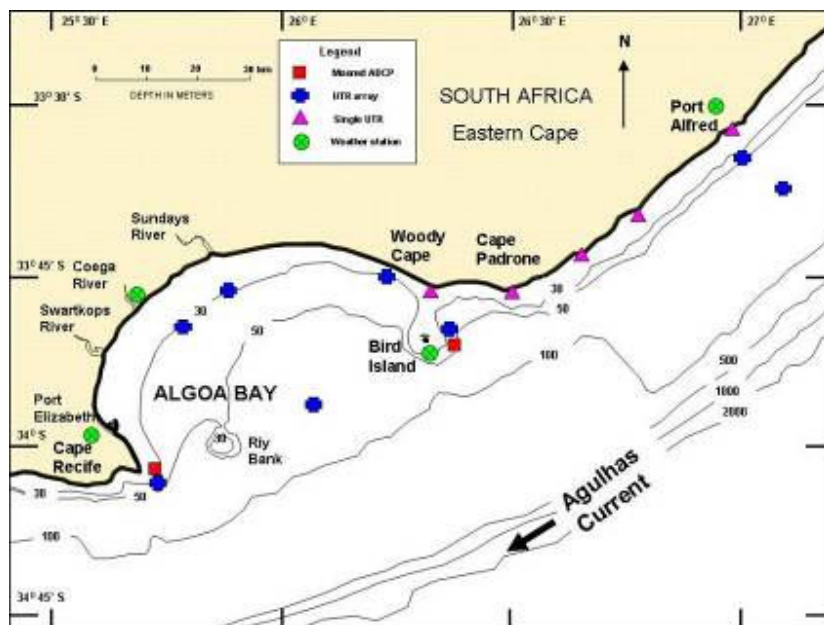


Fig. 1.1: Moored deployment sites in Algoa Bay. Also shown are the SAWS weather stations.

The instruments include two ADCPs measuring currents, 5 gully probes deployed along the shoreline measuring sea temperature and 8 UTR strings measuring sea temperature and pressure. In addition, there are tidal data available from PE Harbour and wind data from several SAWS weather stations. Although a few more delayed-time instrument deployments are planned, efforts are underway to install real-time sensors that will provide open online data via web sites.

Wayne also acts as data manager for the physical data. Elwandle sends the raw data to Wayne, who then processes it into a common structure and readable format with a header section for the metadata. Both human researchers and data management applications can easily read the data in this format. The processed data is then given back to Elwandle for use by students and researchers. Work is in progress to place the metadata on the SAEON data portal and NCCCH (Nairobi Convention Clearing House Mechanism; see section 7). The data itself will eventually be archived in the SADC database and available through the SAEON data portal, and it will be open to the public, <http://data.saeon.ac.za/>.

Some interesting results have come from an initial analysis of the data. From the ADCP deployed at Bird Island it appears that the currents there respond rapidly to a change in wind stress, with little lag, and that the currents are barotropic but decreasing in speed with depth (Fig. 1.2). The gully probes deployed between Woody Cape and Port Alfred show that, during summer, upwelling occurred in direct response to wind, and that upwelling occurred simultaneously along this stretch of coastline (Fig. 1.3). This infers that upwelling in the region is more like an upwelling “zone” than an upwelling “cell”. An analyses of two months of data during summer revealed that coastally trapped waves frequently propagate through Algoa Bay to Port Alfred and beyond (Fig. 1.4). This was evident from substantial increases in sea level (< 1m) accompanied by an increase in northward currents.

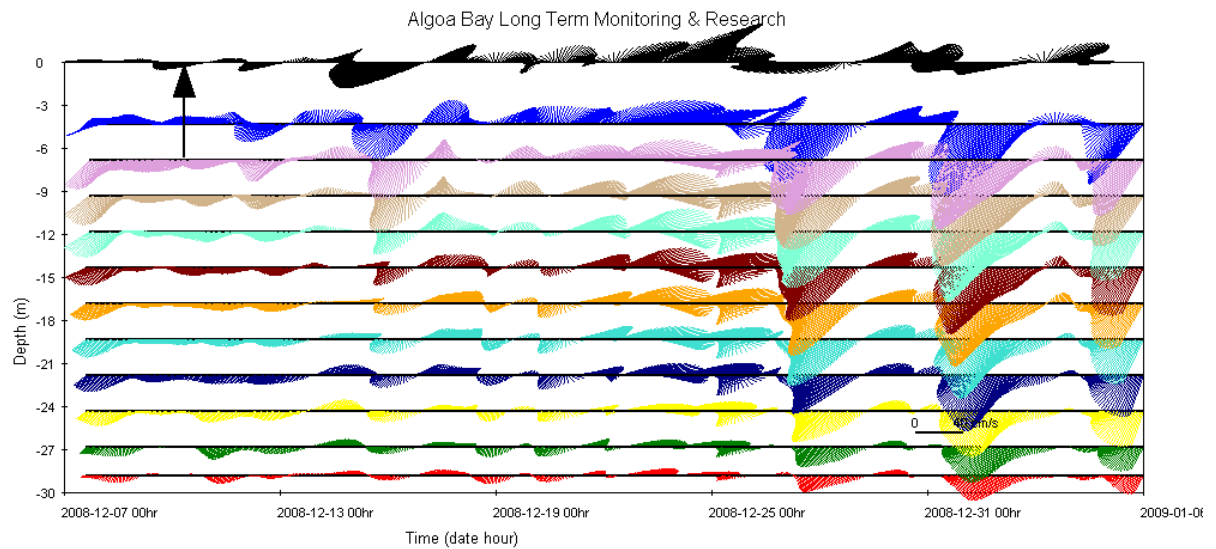


Fig. 1.2: Wind (top plot, black) and currents measured by an ADCP deployed off Bird Island.

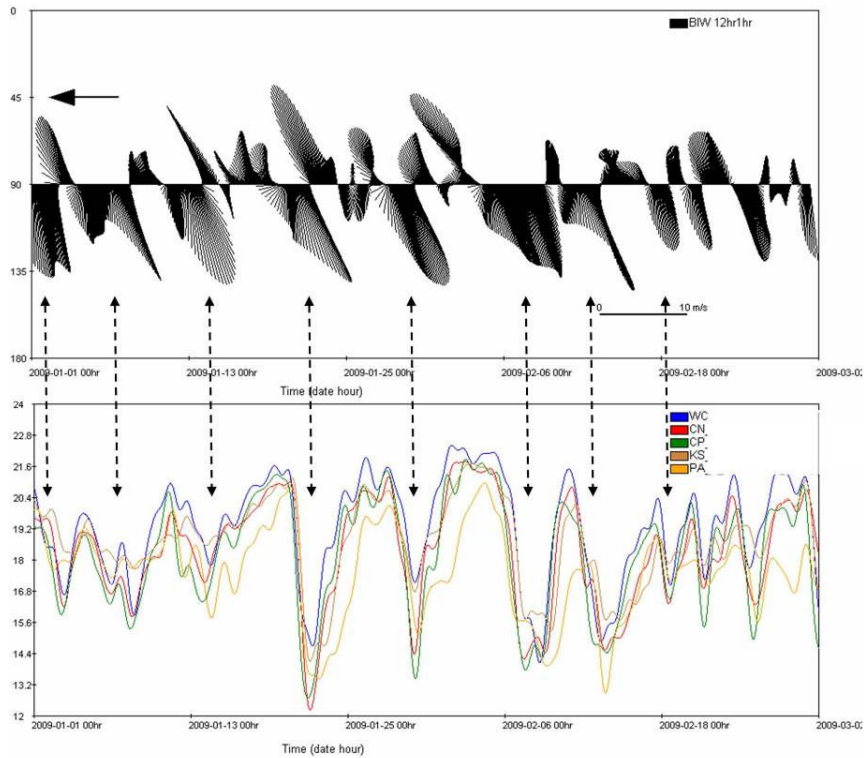


Fig. 1.3: Wind (top plot, black) and sea temperatures from the gully probes deployed between Wood Cape and Port Alfred.

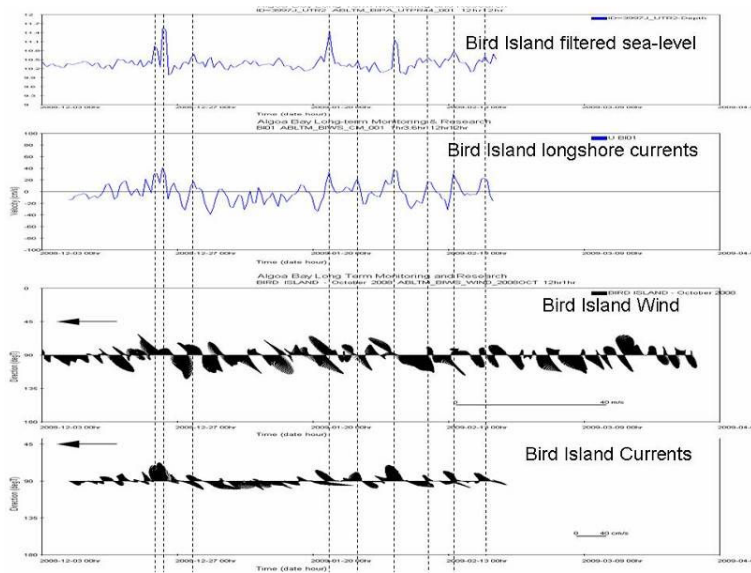


Fig. 1.4: Evidence of coastally trapped waves in Algoa Bay.

1.1. Desktop study of Algoa Bay physical oceanography for the Institute of Marine Technology (Key collaborators, Eckart Schumann and IMT)

Initially, it was important to do a review of the work done in the Algoa Bay region, while also gathering historical data, before the population of the Algoa Bay database could begin. This will help highlight where long-term monitoring needs to focus within this region and add value to the long-term monitoring E and E are doing in Algoa Bay. Further from this report, the Institute for Maritime Technology (IMT) contracted the Egagasini Node to complete a desktop study on the physical oceanographic processes of Algoa Bay, with emphasis on the approaches to Port Elizabeth (PE) harbour. Wayne's PhD focussed on ocean dynamics associated with prominent capes and bays off the Cape south coast, concentrating on Algoa Bay. Wayne was thus able to write most of the report that dealt specifically with the physical oceanography of Algoa Bay and over the adjacent continental shelf as well as the large-scale processes that drive the dynamics. Dr Eckart Schumann wrote a chapter on the nearshore processes in Algoa Bay, in particular on waves and sediment transport around Cape Recife and northwards past PE harbour. A draft report has been accepted by IMT, and work is underway to complete a final version.

Briefly, the report describes how the coastal ocean off Algoa Bay is in a transition zone between the Agulhas Current dominated region to the northeast and the wide Agulhas Bank shelf dynamics to the southwest. Fig. 1.5 shows a typical satellite thermal image of the Eastern Cape which illustrates the large scale ocean dynamics of the region.

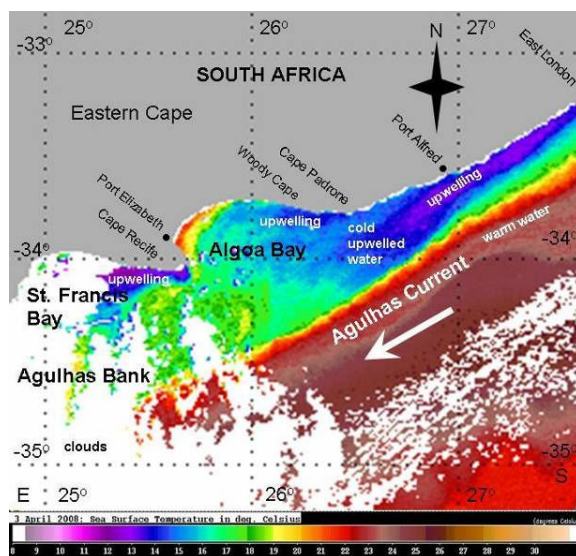


Fig. 1.5: A satellite thermal image showing some of the surface dynamics of the ocean off the Eastern Cape.

Within the bay, interactions between nearshore, coastal and deep-water oceanographic processes, weather systems and local bathymetry and shoreline contours result in a dynamical ocean. Winds generate waves, which move sediment on beaches and in the nearshore, as well as moving sediment in the large dunefields on land. In Algoa Bay, the dominant winds are orientated approximately parallel to the coastline, with the greatest percentage from the west/southwest and the other major direction from the east/northeast. The majority of wave energy is thus associated with waves approaching from the south to west quadrant, while there is also a noticeably higher energy level in waves coming from the east (Fig. 1.6).

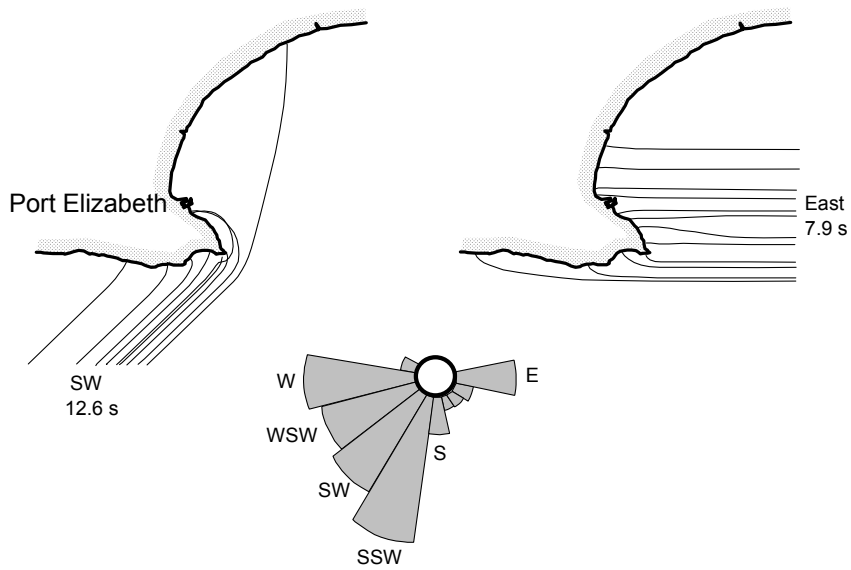


Fig. 1.6: The wave energy rose giving the statistical spread of deepwater wave directions is shown at the bottom. On the left the wave rays are shown for 12.6 s southwesterly swell, while on the right are the rays for 7.9 s easterly.

This results in a northward movement of sediment along the north shoreline of Cape Recife and the building up of sand off the southern breakwater of PE harbour (Fig. 1.7).

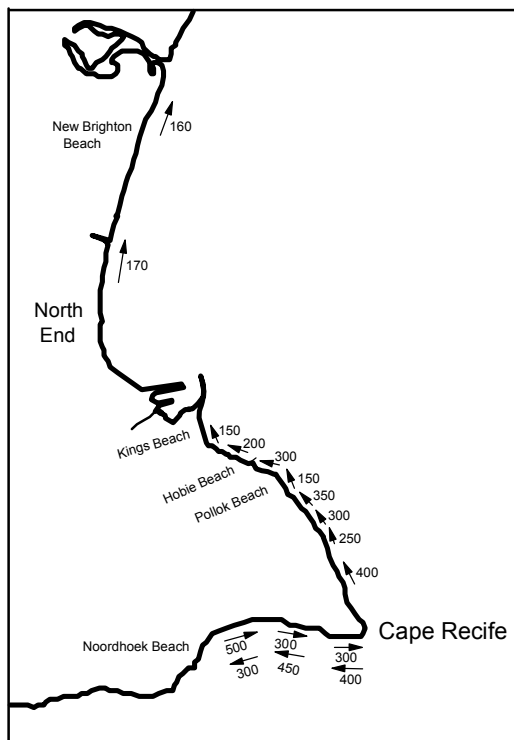


Fig. 1.7: Potential sand transport values using the wave data shown above.

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