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Discussions

Interactive comment on "Coastal gradients south of Cape Town: what insights can be gained from mesoscale reanalysis?" *by* Mark R. Jury

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Coastal gradients south of Cape Town; what insights can be gained from mesoscale analysis?

M.R. Jury

General comments: This paper represents an important contribution towards understanding air-sea interactions in False Bay, the largest bay on South Africa's 2800 km coastline. Given its size and the strategic geographic location of False Bay at the boundary of the warm Agulhas Current ecosystem and the cold Benguela upwelling system, False Bay has until recently, received less attention than it deserves. This paper also has additional value by linking remote sensing studies with in-situ oceano-

graphic data which other than the CUEX project (Shannon, 1985), is missing from local South African oceanographic programmes.

Specific comments: This paper deals almost exclusively with False Bay and it would be more meaningful if this was borne out in the title of the paper. The use of "south of Cape Town" in the title and frequently in the text (Lines 29, 68, 76, 85,92, 120,129, 141, 188, 237 etc.) is misleading. To those familiar with the area, "south of Cape Town" most often refers in the oceanographic sense, to the southernmost portion of the Benguela upwelling system, along the western seaboard of the Cape Peninsula. False Bay is "around the corner" and quite different in its physical, chemical and biological oceanography as it lies in a mixing zone between two contrasting ecosystems.

It would add value to the paper if the author were to refer more extensively to earlier literature linking this study to earlier findings and theories. For example, 1. A paper by the author, Kamstra and Taunton-Clark (1985) dealing with a related study just to the west of this study " Synoptic summer wind cycles and upwelling off the southern portion of the Cape Peninsula" 2. The first marrying of remote sensing and in situ oceanographic measurements attempted in the region during the South African Ocean Colour and Upwelling Experiment (CUEX) and published in a book edited by L.V. Shannon (1985). Remote sensing data has evolved considerably in the interim as is evident from the paper under consideration. 3. To those oceanographers who have spent their lives at sea collecting data it is always an anathema that modern day oceanographers can derive so much from data sets gathered by satellite and we are naturally suspicious of this armchair oceanography. The author needs to allay our fears. An early paper issued as a report of the then Sea Fisheries Branch on the use of driftcards to study ocean currents off the SW Cape found that currents in False Bay were influenced by the state of the tide and the wind direction. Speed and direction changed dramatically under different regimes. Satellite overpasses occur in an instant in time and do not take this into account. Can the author discuss or dismiss this? 4. One of the earliest studies of air-sea interactions in southern African waters is the seminal paper by Nils

Bang (1971; Deep-Sea Res18 :209-224. This used to be compulsory reading for all studying oceanography in South Africa as an example of how a good set of data, in the case of this paper taken with the humble bathythermograph, can be used through eloquent writing and insightful analysis to describe the response of a vast upwelling system to wind forcing associated with a SE wind gale. I would have thought this paper by Jury might make reference or a comparison to this work, if only to contrast the vast data sets available to the modern day oceanographer and to admire what Bang and earlier oceanographers were able to achieve with infinitely less. In reviewing this paper by Jury I am encouraged by what the author has achieved and after careful correction it should be ready for publication but I do sense that the author(s) could achieve even more given the data at their disposal. Maybe it is their intention to follow this somewhat abbreviated analysis with further work? The author has managed to unearth an admirable amount of information from internal reports of various institutions in the SW Cape not easily accessed by others and is to be complimented on this.

Technical corrections: Lines 4 to 5. Is there a second author missing here? See comment on Line 149 and references to the “first author” in acknowledgements. Line 38 latitudinal Line 54 “southern” in relation to central Cape Town but northern in relation to False Bay Line 60 Remove very. A very productive Bay would be exemplified by St Helena Bay lying to the north and wholly in the Benguela upwelling system where chlorophyll a levels as high as 20 to 30 are not uncommon. Note the author refers here and elsewhere to “chlorophyll”. Is this correct in the case of satellite-derived ocean colour? In situ measurements are made in terms of chlorophyll a, b and c but normally only reported as the first and dominant of these. Line 62. See L. 54. Line 67 Reference? Line 97 etc. is vague and lazy Line 105 many variables see L97 Line 109 better characterizes could be rephrased using better English Line 115 see L109 Line 120 and elsewhere in situ. Lines 121 to 125 avoid abbreviations and give correct names. It is the Council for Scientific and Industrial Research (CSIR) and the rather laborious Department of Environmental Affairs: Oceans and Coast Branch (DEA: O&C) formerly Sea Fisheries Research Institute. Line 149 We ? Line 151 define where the

Cape Flats are for those unfamiliar with the geography of Cape Town eg. The low-lying, coastal plain to the southeast of Cape Town. What is meant by southern coasts? Note: Latitude lines or ticks missing from Figs 2 a and b. Line 158 Venturi effect Line 181 (station) ? Lines 181 to 183 presumably “before” and “after” refer to passage of the coastal low? If so. spell this out for the reader. Lines 184 to 186. Thought-provoking but not clear what author is conveying here? Is he inferring that air-sea interactions associated with the passage of the coastal low results in upwelling of colder, higher nutrient deep water into the surface layers thereby increasing primary production some days later? Lines 207 to 208. The cold water dominating False Bay in December 2012 is pronounced and undoubtedly upwelling in the Cape Hangklip area is partially responsible but unlikely to have flooded the entire bay. What is more likely at play in Figs 3 e and f is a nice depiction of the role played by False Bay at the boundary between the Benguela upwelling system and the Agulhas Current ecosystem. The Bay begins in December 2012 showing the characteristics of the former, rapidly changing to the latter as warmer, lower productivity waters rapidly displace these surface waters during January 2013. The same SE wind-induced upwelling that occurred off Cape Hangklip has occurred in the more intense upwelling centre off Olifantsbos around the corner on the western side of the Cape Peninsula. The author himself states in line 206 that there is a cold upwelling plume west of Cape Town. Although the author has stated that the zonal current displacement at the shelf edge to the SW of False Bay is predominantly westward, leakage of upwelled Benguela waters back eastward into False Bay is frequently seen along the narrow inner shelf during research cruises to the Cape Point area and in studies of early large scale infra red imagery from this area. This cold, high nutrient Benguela upwelling system water has then entered False Bay in the SW corner, spreading via the clockwise circulation throughout the bay. Line 281 name the co-authors Line 301 name the co-authors Line 337 Abbreviation?

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