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SADCO
SADSO

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Contents

Articles

Figures



More Automatic Weather Station data from SAWS

Hourly observations of Automatic Weather Stations along the South African coast for 2006 and 2007 have been received from the South African Weather Service

Over the years SADCO has experienced excellent support from the South African Weather Service (SAWS).

Previously, Chris Koch kindly offered to supply SADCO with weather data collected by the manifold coastal automatic weather stations (AWS). In the Feb 2006 Newsletter we reported that approximately 10 years (up to December 2005) of hourly data from 33 stations had been submitted by SAWS – a huge set by any standards. Data from Gough Island data was later added.

Recent addition

This support is continuing with Tracey Gill as the SAWS representative on the SADCO Steering Committee. Following up on a recent request, Tracey augmented this set of AWS data with data collected up to December 2007 (see Table 1 for full data set coverage, and Fig. 2 for the locations)).

Figure 1: Tracy Gill, South African Weather Service

We wish to record our appreciation to Tracey and the SAWS. The data is scheduled for loading after 1 April, and the next Newsletter should provide some examples of the data.

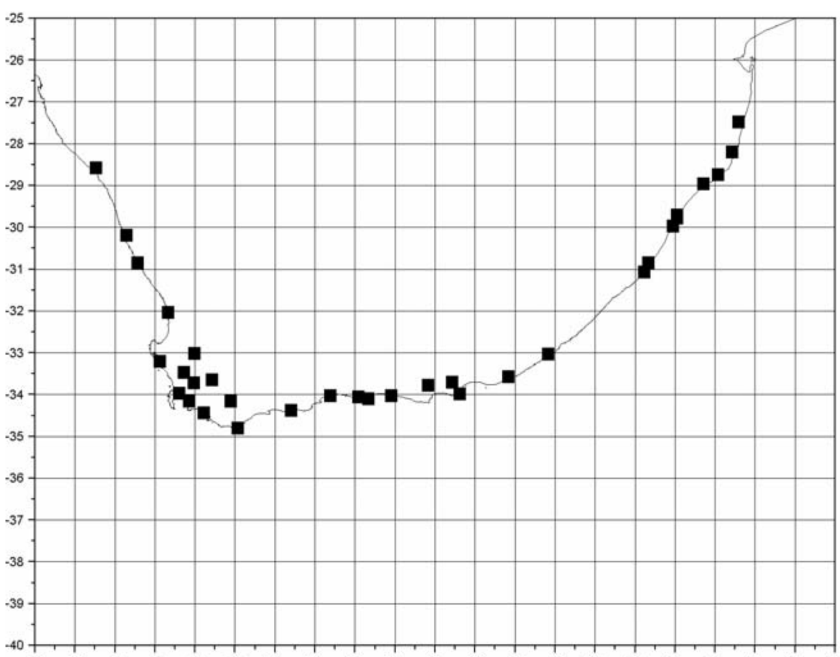

Figure 2: Locations of the AWS stations along the South African coast (excluding Gough Island)

More Automatic Weather Station data from SAWS continued...

Table 1: Overall coverage of the weather station data received from the SAWS

Place	Lat	Long	Start date	End date	Height
Alexander Bay	-28.57	16.53	01/01/1996	31/12/2007	25
CAPE TOWN WO	-33.97	18.60	01/01/1996	31/12/2007	42
CHARTERS CREEK	-28.2	32.42	01/01/1996	31/12/2007	8
DURBAN	-29.97	30.95	01/01/1996	31/12/2007	14
EAST LONDON	-33.03	27.83	31/01/1997	31/12/2007	116
GARIES-GROENRIVIER	-30.85	17.57	01/06/1999	31/12/2007	17
GEELBEK	-33.20	18.12	01/03/1997	31/12/2007	7
GEORGE WO	-34.02	22.38	01/01/1996	31/12/2007	191
GOUGH	-40.35	-9.88	01/04/1963	31/12/2007	
HERMANUS	-34.43	19.22	01/09/1996	31/12/2007	13
KNYSNA	-34.06	23.09	01/07/1996	31/12/2007	54
KOINGNAAS	-30.18	17.28	01/01/1996	31/12/2007	99
LAMBERTSBAAI NORTIER	-32.03	18.33	01/01/1996	31/12/2007	94
MALMESBURY	-33.47	18.72	01/01/1996	31/12/2007	102
MARGATE	-30.85	30.33	01/01/1996	31/12/2007	154
MBAZWANA AIRFIELD	-27.47	32.58	01/08/1997	31/12/2007	61
MOUNT EDGECOMBE	-29.70	31.05	01/01/1996	31/12/2007	94
MTUNZINI	-28.95	31.70	01/01/1996	31/12/2007	38
PAARL	-33.72	18.97	01/01/1996	31/12/2007	103
PATENSIE	-33.77	24.82	01/01/1996	31/12/2007	101
PLETTENBERGBAAI	-34.09	23.33	01/01/1996	31/12/2007	139
PORT ALFRED	-33.57	26.83	23/11/2001	31/12/2007	84
PORT EDWARD	-31.07	30.23	01/01/1996	31/12/2007	11
PORT ELIZABETH	-33.98	25.61	01/01/1996	31/12/2007	63
PORTERVILLE	-33.02	18.98	01/01/1996	31/12/2007	112
RICHARDS BAY AIRPORT	-28.73	32.08	01/06/2002	31/12/2007	36
STILBAAI	-34.37	21.40	01/01/1996	31/12/2007	103
STRAND	-34.15	18.85	01/05/1996	31/12/2007	10
STRUISBAAI	-34.80	20.07	01/01/1996	31/12/2007	3
TSITSIKAMMA	-34.03	23.91	01/01/1996	31/12/2007	5
TYGERHOEK	-34.15	19.90	01/01/1996	31/12/2007	151
UITENHAGE	-33.7	25.43	01/01/1996	31/12/2007	157
VIRGINIA	-29.77	31.05	01/01/1996	31/12/2007	14
WORCESTER-AWS	-33.65	19.42	01/11/1998	31/12/2007	199

NOVEL ADDITION TO SADCO: WAVE BUOY DATA

For the first time wave buoy data is being added to SADCO's archive of time series data.

VOS data

Up to recently, SADCO's wave data was confined to the visual observations made from ships-of-opportunity or VOS (Voluntary Observing Ships). Such observations are made by officers on watch, and are based on the observer's experience to judge the wave and swell height correctly.

The visual wave observations are reported only to the nearest ½ metre, and are geographically located where the observing vessels happen to be at the time (these are normally at “synoptic hours”, at 0:0, 6:00, 12:00 and 18:00 UTC).

VOS observations are not distributed uniformly throughout the world oceans, but are located where the merchant vessels ply the oceans along well-defined routes (shipping lanes). Around southern Africa the routes of the vessels are delineated by the positions of reported VOS observations (Fig. 3). A more uniform geographic distribution of wave data is provided by satellite observations (e.g. the Geosat, TOPEX/POSEIDON and other satellites' wave data sets).

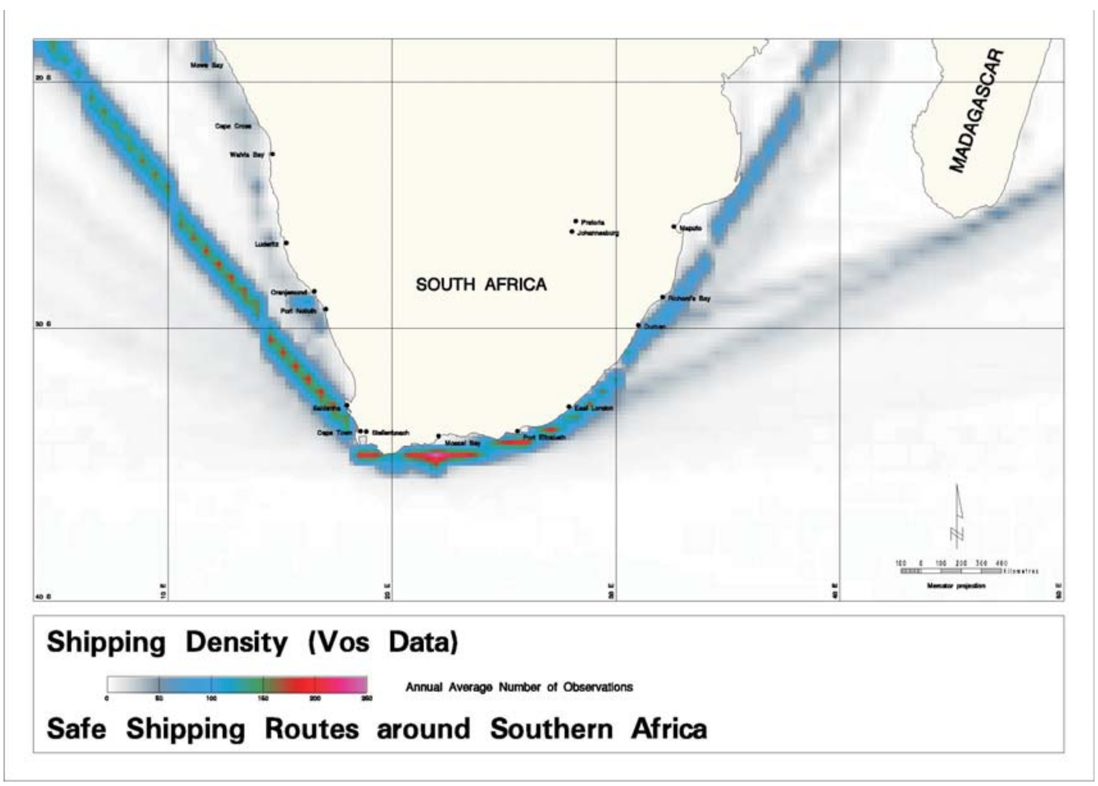

Figure 3: Shipping lanes around South Africa, as portrayed by the positions of VOS observations

Novel addition to SADCO: wave buoy data continued...

Because of their timeous availability VOS observations play a key role in forecasting and to provide insight into wave observations in a location or at a time when no other observations are available.

Wave buoy data

However, none of the data types mentioned above can provide the type of information required for accurate design specifications (e.g. the design of ports and breakwaters, fixed or floating platforms, etc).

To provide information required for maritime designs a moored instrument, recording at regular intervals (e.g. every 6 hours, 3 hours, hour, or 20 minutes) is required. Such instruments normally fall in the category of wave buoys, although wave information can also be obtained from moored underwater instruments (e.g. Acoustic Doppler Current Profilers).

The collection of inshore wave data for engineering purposes in South Africa goes back to the 1960s, using a clinometer (telescope-like instrument with graduations aimed at a target of moored buoys about a kilometre offshore) (see http://wavenet.csir.co.za for the history of wave recoring in South Africa).

The first wave buoy, using an onboard accelerometer, was deployed in 1969 and they started becoming operational in the late 1970s, the first sustainable data set being collected at Slangkop from 1977 onwards. Over the next 2 decades wave data started being collected at all the South African ports. Initially some of the wave stations were sponsored by more than one organisation, but over the past 10 years the National Ports Authority (previous Portnet) has been the main sponsor. (Other wave records that we know about is the wave data collected on the FA platform on the Agulhas Bank by Mossgas; on the Single-Point-Mooring off the Mlazi canal (Durban) by SAPREF; close to the Coega harbour in Algoa Bay on behalf of NPA; and off the Orange River mouth by NAMDEB).

The wave data collected at the South African ports is integrated (along with tides and vessel information) into a port operating system that provides the port authorities with decision support to manage vessel movements into and out of the ports. Latest wave buoys also collect information on wave direction, while older models collected only **wave height** and **period** data.

In most of the cases, the CSIR has been the collecting organisation on contract to the various sponsors. Over the years, sections of the data have been provided to various users, and real-time data graphs are available (http://wavenet.csir.co.za). SADCO has been provided permission to load parts of the older data, and the following sets are in the process of being loaded:

Slangkop (Cape Point)	1977 – 1985
Richards Bay	1979 – 1985
Saldanha Bay	1981 – 1985

The data will be flagged initially, and it is hoped that, with time, more data will be released.

Quality of nutrient data in SADCO

The recent audit of the quality of SADCO's subsurface data revealed an uncomfortably large percentage of errors in the phosphate and especially silicate data. One of the sources of the errors was discovered.

In the previous Newsletter (December 2007) details were presented on the audit that has been completed on the quality of the data in SADCO. At the time, it was realised that audit is only a statement of the status of the quality, and that the ultimate quality of the database can only be improved if the errors are removed. Suggestions were made on “the way forward”, and how the data can be corrected.

When the quality control process was discussed at the meeting of the SADCO Steering Committee in November, the Table presented in the December Newsletter p 6 (partly reproduced in Table 2 below) elicited some comment, particularly the high percentage (31%) of silicate values that failed the envelope check.

Tracking of (one of) the errors

By coincidence, SADCO recently had a query from the World Data Centre on some nutrient values that had, along with some older hydrographic stations, been submitted to WDC a few months ago.

Using the station references supplied by WDC, the cruise and date were identified, and since the cruise was executed by the CSIR in 1969, a trip to the CSIR's raw data storage produced the following insight:

- The raw data sheets showed the correct, handwritten values for total phosphorous and reactive silicate (see e.g. Fig. 4).
- It appears that the data was then typed by a typist, for further use by the researchers (Fig. 5). At this stage the values were still correct.

Table 2: *Amount of data and corresponding percentage of flags*

Parameters

Parameter	DPTH	OXY	SAL	TEMP	NO3	PO4	SIO4
Total stations with parameter		48363	90098	219625	17862	30738	3026
% of Total stations		19.9%	37.0%	90.2%	7.3%	12.6%	1.2%
Total observations	31870895	6877493	13003406	31807494	145994	289984	42031
% of Total depths	100.0%	21.6%	40.8%	99.8%	0.5%	0.9%	0.1%

Flags: Percentages

Parameter	DPTH	OXY	SAL	TEMP	NO3	PO4	SIO4
No of stns with profile flags		6.31%	6.98%	4.34%	3.83%	7.58%	7.96%
No of obs failed inversion/gradient checks	0.01%		0.00%	0.08%	2.39%	0.00%	
No of obs failed envelope check		2.29%	0.73%	1.01%	2.52%	4.12%	31.19%
No of obs failed broad range check		0.07%	0.12%	0.15%	0.68%	0.35%	0.01%
No of obs failed spike check		0.00%	0.03%	0.01%	0.02%	0.01%	0.00%

Quality of nutrient data in SADCO continued...

- Later, the data was punched onto punch cards as part of the digitisation and computerisation process that eventually led to incorporation of the data into SADCO. A copy of the computer printout (Fig. 6) showed that the decimal point had been omitted during the punching process. The error was intermittent, e.g. it appears that the "15.8" of the raw silicate values at 10m depth was incorrectly punched as "158", while the rest of the silicate values were transferred correctly.

It is uncertain at this stage whether punching errors caused all the errors in the nutrients indicated in the summary Table above. However, it is at least ONE of the errors, in a measuring process that should normally be quite meticulous (all nutrient values are analysed individually).

Discovering errors in a database remains a painful process. The audit process correctly identified these values as erroneous (see Table 2), and this means that users of the data will now be alerted to the incorrect levels.

However, given the dearth of nutrient values, and the possibility that the data set can be corrected, a cleaning up process is obviously called for. Unfortunately, the checks and corrections have to be done manually. During the comprehensive data audit every data error was logged with its reference in terms of station and survey, and this allows errors to be traced. Where the raw data is available (probably not for all the data) the errors can be backtracked to the original files.

It seems that the analysis and reporting of the data was based on correct nutrient data, but the process of computerisation introduced (new) errors that were not picked up.

Checking and rechecking data is expensive (and tedious!) and should be done as cost efficiently as possible at every major stage of the data processing.

CRUISE 69/4

Nom. Depth (m)	Sal-inity (°/oo)	Total Phos. (µg/L)	React Silic (µg/L)	Nit-rate (µg/L)	Nit-rite (µg/L)	Rel. Speed (m/s)	Curr. Dir. (°T)	True Depth (m)	Temp. (°C)	True Speed (m/s)	Curr. Dir. (°T)	Lns/ Coef Drif Lne Norm Ship
0	306					—	—	0	25.2	—	—	
10	306	17.3	15.8			·30	179	10	25.1	+·17	0·0	
30	305					·28	155	30	20·4	+·06	-·07	
50	358	29.7	129.2			·40	186	50	15·4	+·27	-·02	
100	256	33.4	139.3			·32	180	100	13·4	+·19	-·01	

Nom. Depth (m)	Sal-inity (°/oo)	Total Phos. (µg/L)	React Silic (µg/L)	Nit-rate (µg/L)	Nit-rite (µg/L)	Rel. Speed (m/s)	Curr. Dir. (°T)	True Depth (m)	Temp. (°C)	True Speed (m/s)	Curr. Dir. (°T)	Lns/ Coef Drif Lne Norm Ship
0	297					—	—	0	26.5	—	—	
10	339	17.8	77.5			·40	219	10	26.5	+2.30	+.16	
30	363					·22	176	30	23.7	+2.06	+.01	
50	364	29.7	136.4			·20	52	50	17.4	+1.70	+.12	
100	353	32.2	129.9			·53	83	100	15.0	+1.52	-.22	

Figure 4: Raw data entries for station 59 of the Meiring Naudé cruise MN6904. The ringed entries show the total phosphorous and reactive silicate values at 10, 50 and 100 depth.

55	10	17.8	54.6
	50	20.3	59.6
	100	33.6	169.4
56	10	28.7	57.4
	50	20.8	118.4
	100	39.6	116.6
57	10	19.0	21.5
	50	32.2	137.8
	100	33.6	137.8
58	10	17.3	12.2
	50	33.1	170.9
	100	38.5	165.1
59	10	17.3	15.8
	50	29.7	129.2
	100	33.4	139.3
60	10	17.8	77.5
	50	29.7	136.4
	100	32.2	129.9
③61	10	20.8	27.7
21-2306	50	-	-
	100	-	-
62	10	24.7	84.7
	50	21.3	71.1
	100	28.7	154.3

5/.....

Figure 5: Typed version of the data (part of which is shown in Fig. 4), with columns of station number, depth, phosphorous and silicate. The indicated values correspond to Fig. 4.

DATE	SAST	LATITUDE	LONGITUDE	DEPTH
1969.02.21	2015	29 55.8S	031 22.2E	XXXXM

WIND		CLOUD		VIS	WEA	SEA			SWELL			DRIFT	
M/S	DEGT	T	A			M	DEGT	S	M	DEGT	S	M/S	DEGT
07	180	XXXXX		XX	XX	X.X	XXX	XX	X.X	XXX	XX	0.20	327

S VEL	DYN HT	CURRENT		COMPONENTS		O2	P	SIL
M/S	DM	M S	DEGT	218D	308D	ML/L	UG/L	UG/L
1535.2	.000	$$$$	$$$	$$$$$	$$$$$	$$$$	$$$$	$$$$
1535.1	.048	.17	218	.17	-.00	$$$$	173	158
1523.4	.122	.11	170	.07	-.08	$$$$	$$$$	$$$$
1509.2	.171	.28	213	.28	-.02	$$$$	297	129
1503.5	.256	.17	219	.17	.00	$$$$	334	139

S VEL	DYN HT	VAISLA	CURRENT		COMPONENTS		O2	PO4	SIL
M/S	DM	HZ	M/S	DEGT	218D	308D	ML/L	UG/L	UG/L
1535.2	.000	$$$$$$	$$$$	$$$	$$$$$	$$$$$	$$$$	$$$$	$$$$
1509.9	.157	.0223	.27	211	.27	-.03	$$$$	294	130
1503.1	.243	.0091	.17	219	.17	.00	$$$$	333	139

Figure 6: After punching the data for station 59 the computerised records show that the decimal point has been omitted from the phosphorous values, making them a factor 10 too large and the first value of silicate (158) is also too large (cf. 15.8 in Fig. 4 and 5).

Layout & Design: Magdel van der Merwe
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