

# The South African Mercury Network (SAMNet) current status and future plans

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# How did it all start



## The Cape Point GAW Monitoring Program





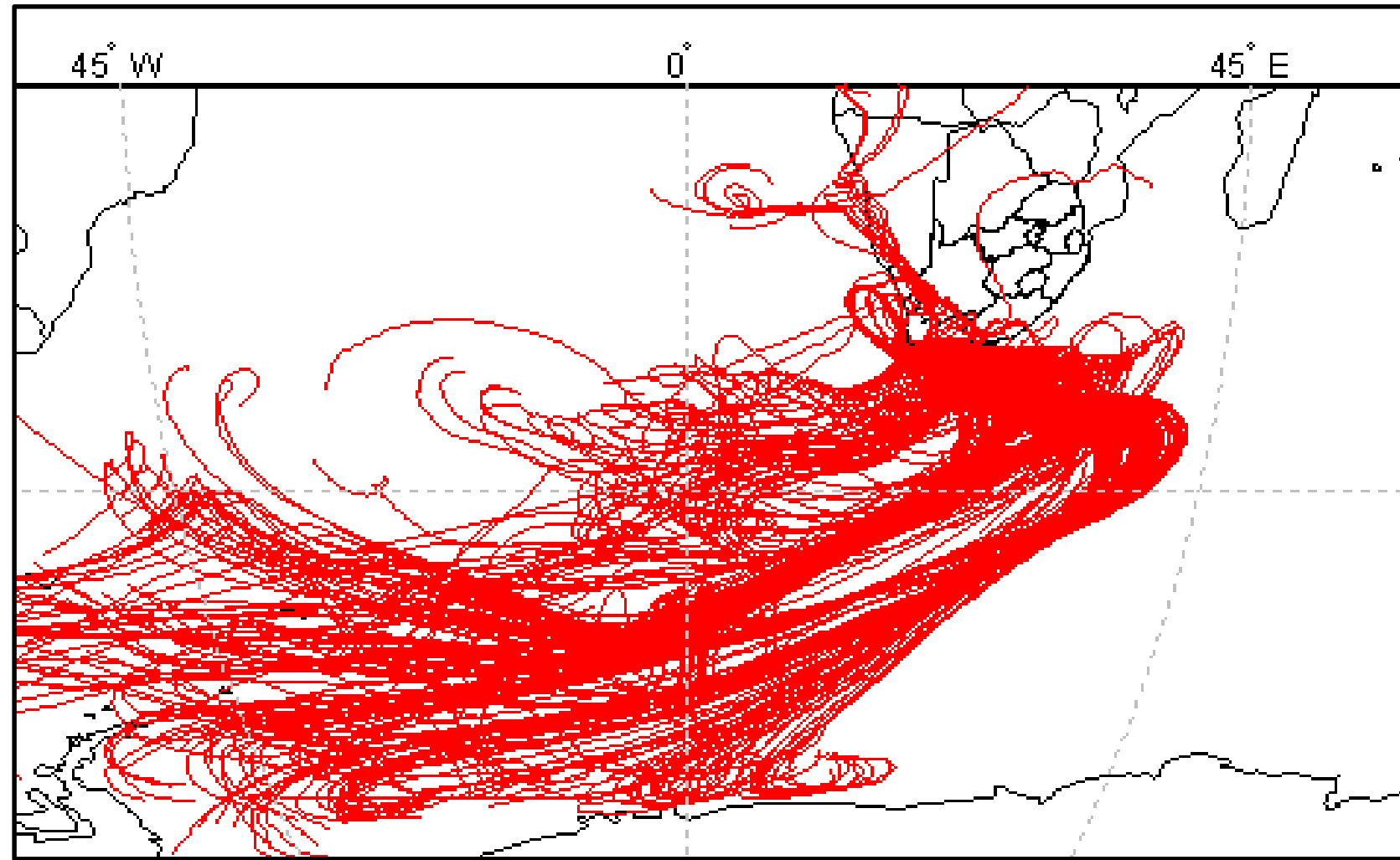
# What is the Global Atmosphere Watch (GAW) Program

- WMO GAW coordinates activities and data from 31 Global Stations, >400 Regional Stations, and around 100 Contributing stations operated by Contributing Networks
- CPT first measurements started 1978 (CO and CFC's)
- Official WMO GAW status achieved in 1995
- Strategic position of CPT w.r.t. southern hemisphere
- Currently more than 25 different atmospheric species
- Monitored at CPT
- Greenhouse gases, reactive gases, aerosol properties

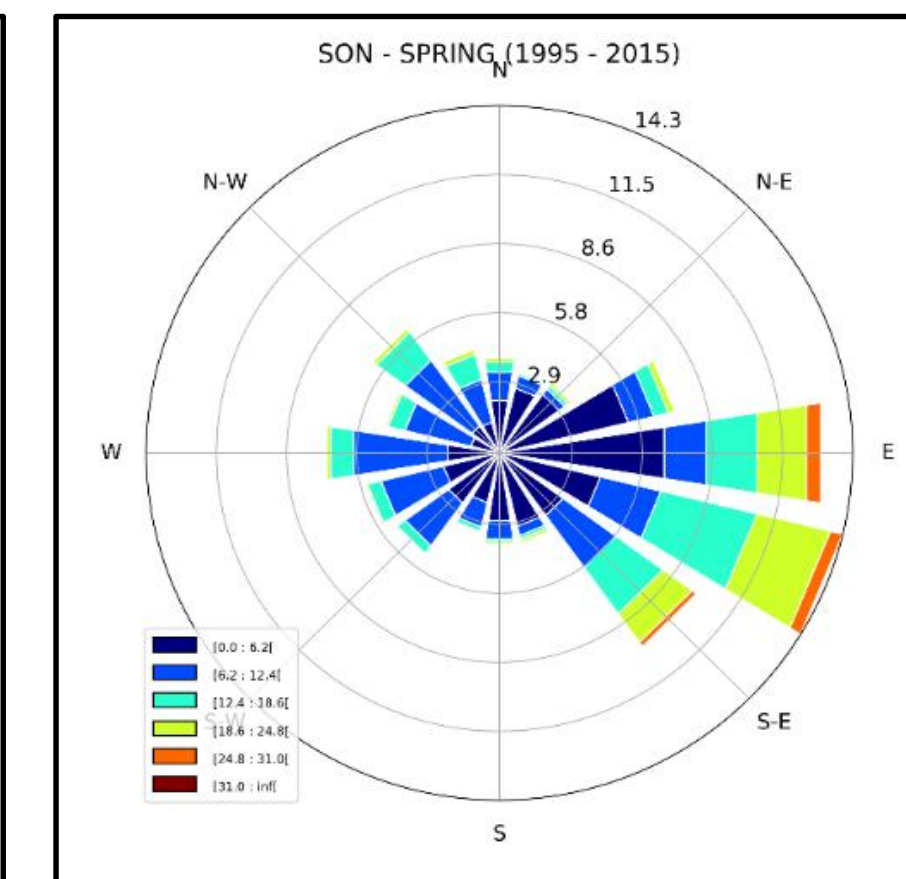
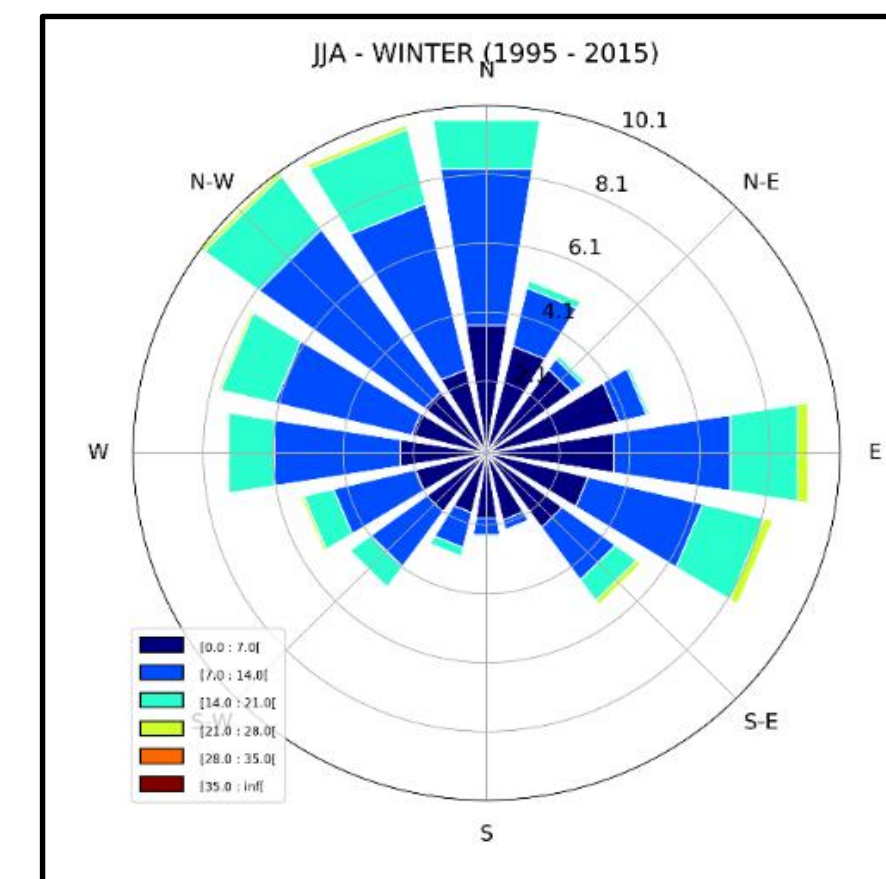
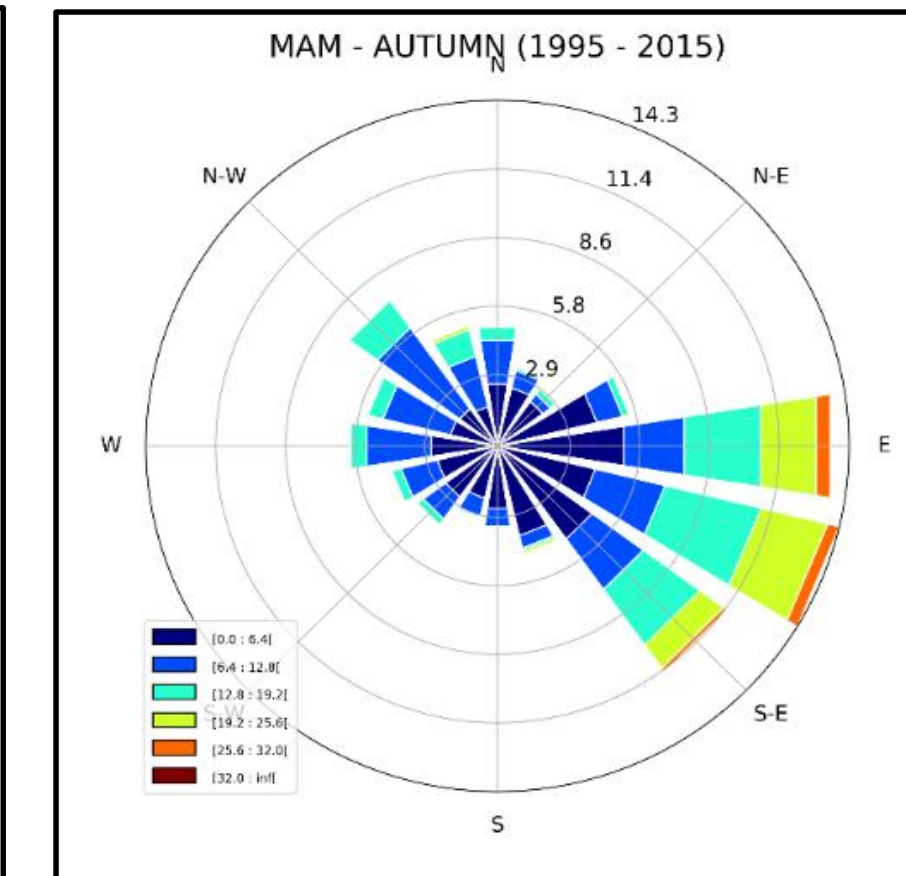
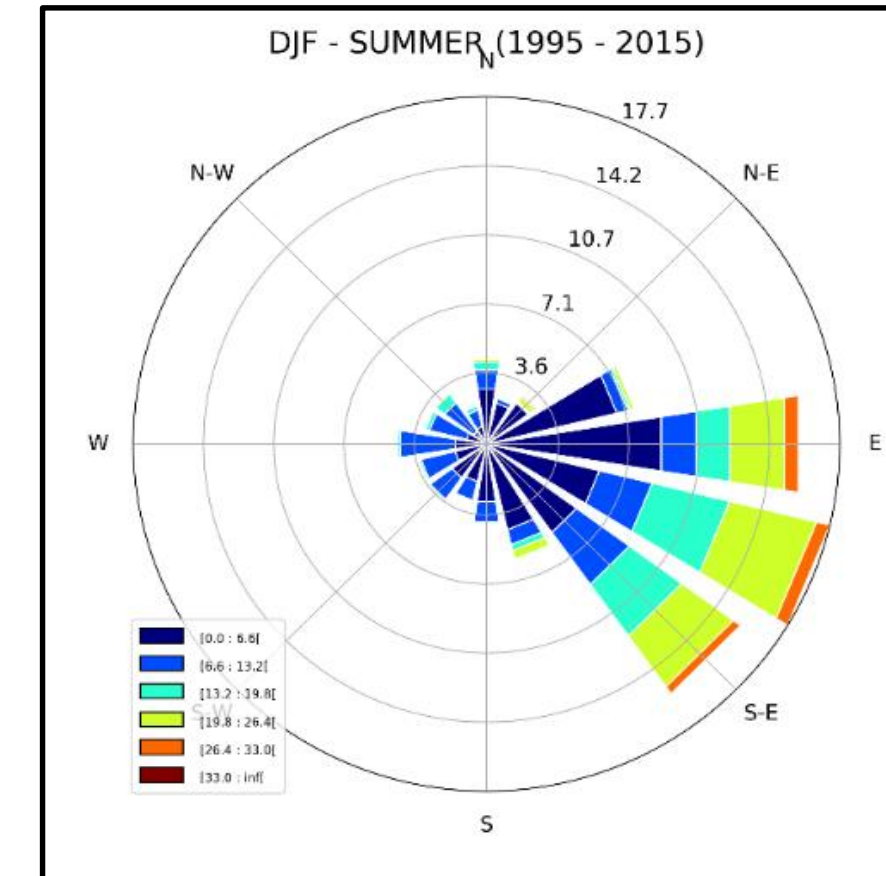




# Cape Point unique location and Dominant Air Masses



- Clear distinction between marine and continental flows
- Summer – Winter seasonality reflects in data sets





# Cape Point GAW Mercury Program





# CPT Mercury Program History & Findings

- Measurements of (GEM) Cape Point started in Sep 1995
- Manual Gold Amalgamation Method
- 8 Samples per week
- Downward trend September 1995 till December 2005
- March 2007 High Resolution Measurement started with Tekran 2537A
- July 2007 Wet Deposition Sampling (Bulk)
- **Upward trend for 2007-2017 is still significant at Cape Point, but driven by the 2007-2014 data.**
- **None or slightly downward trend detected for 2012-2017 at both Cape Point and Amsterdam Island.**

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<https://doi.org/10.5194/acp-20-10427-2020>  
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Atmospheric  
Chemistry  
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## Atmospheric mercury in the Southern Hemisphere – Part 2: Source apportionment analysis at Cape Point station, South Africa

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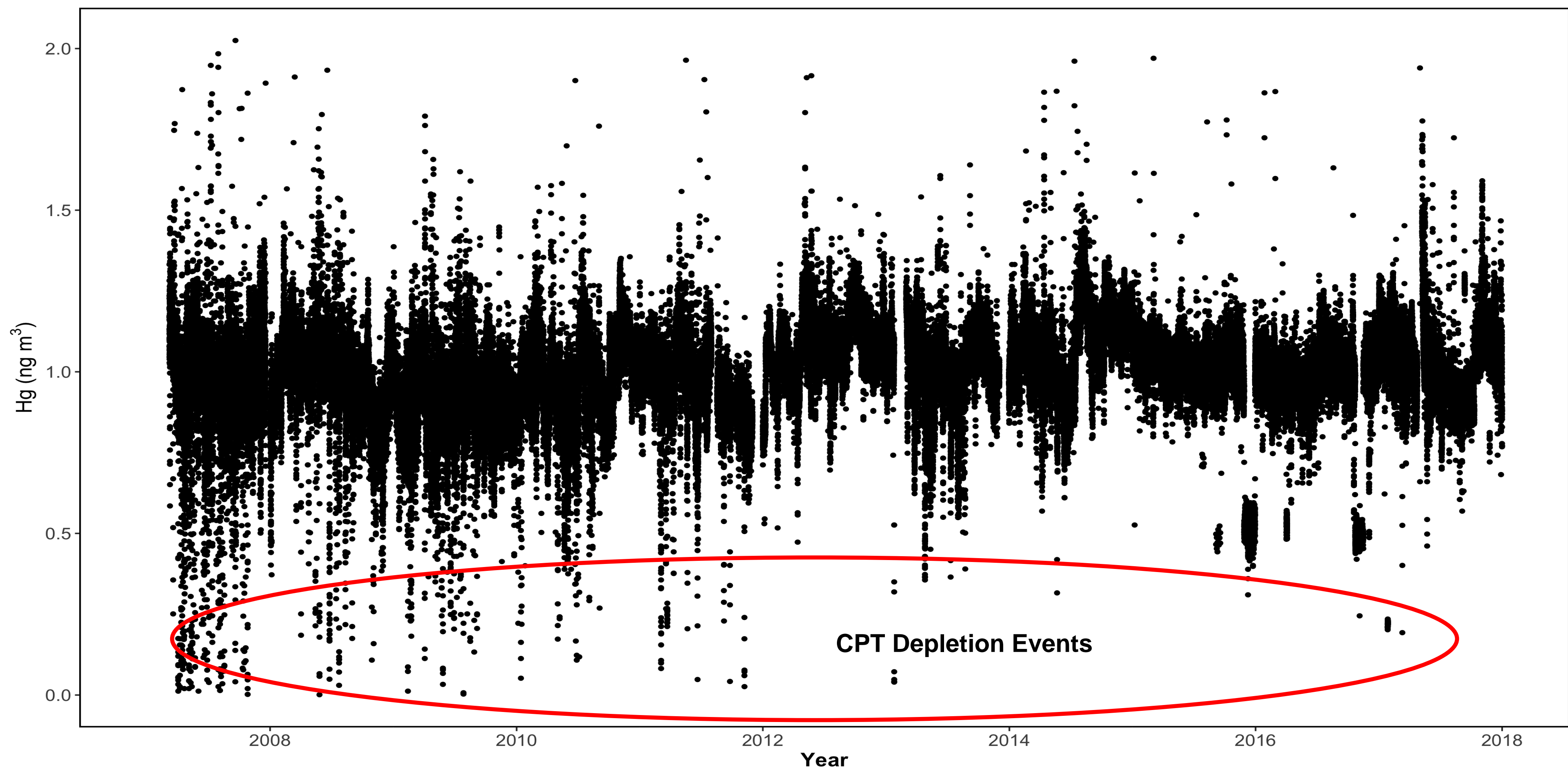
Received: 22 January 2020 – Discussion started: 20 February 2020

Revised: 25 June 2020 – Accepted: 6 July 2020 – Published: 8 September 2020





# CPT Mercury Program History & Findings



Advantage of long term monitoring, determine trends and observes interesting phenomena's

# CPT Mercury Latest Study: AMDE for ICMGP 2022

## POLAR AMDEs

- Occur in Spring – at Polar sunrise
- Can last multiple days
- Linked with ozone depletion events
- Halogen chemistry

## Cape Point AMDEs

- ~~Occur in Spring – at Polar sunrise~~
- ~~Can last multiple days~~
- ~~Linked with ozone depletion events~~
- ~~Halogen chemistry~~

- Typically occur in both Spring and Autumn<sup>1</sup>
- Short duration ~4 hours<sup>1</sup>
  - No correlation to ozone depletion<sup>1</sup>
- Maybe, but there are no measurements

<sup>1</sup>Brunke et al. 2010



# What do we think is happening?

## Halogens

- e.g. BrO

## Criegee Biradicals

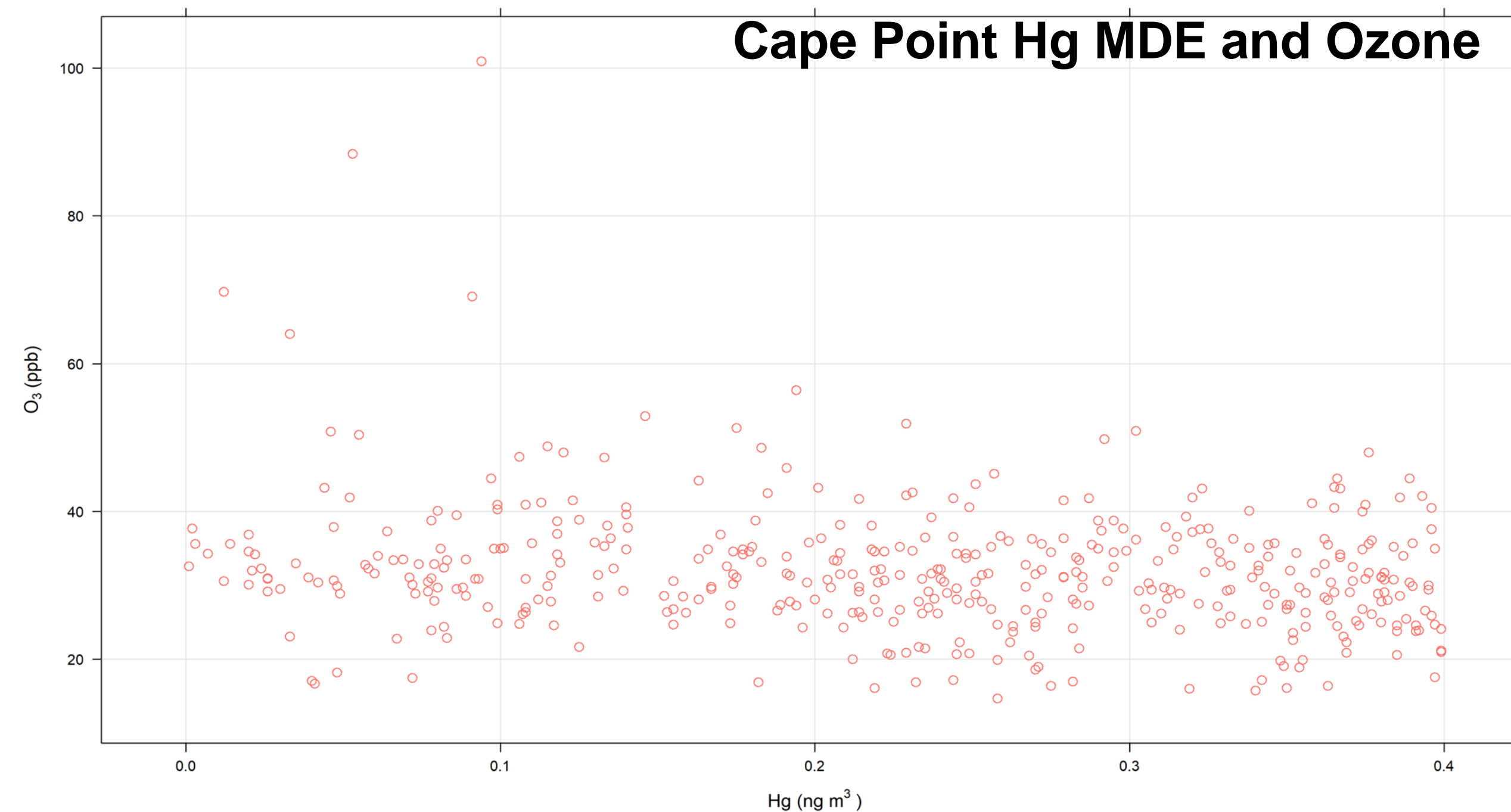
- locally produced – involving ozone chemistry

## NO<sub>x</sub>

- suppression of halogen chemistry

## CINO (Nitrosyl chloride)

- direct depletion of Hg





# CPT Mercury Program History & Findings

- CPT MDE Phenomena currently under investigation (Speciation Unit coming Dec 2020)
- Cape Point monitoring station is largely representative of an area that is **not situated** within the bulk of SA mercury emissions. (coal fired power plants, mining all up North)
- A large percentage of the SA **emissions are not captured** with this sampling program.
- The logical next step will be to expand the mercury monitoring network within SA.
- SAMNet was established for this.



# The SA Mercury Network (SAMNet)

- SAMNet Phase 1 started on 1 April 2020 and is a 2-year funded project from DSI (\$600K US)
- DSI the focal point for SA within GEO
- Infrastructure upgrade at Cape Point (Speciation Unit and new 2537X)
- **Establish 3 new Hg ambient stations.**
- **5 Wet deposition location throughout the country**
- 5x MSc Projects related to Hg research
- **Investigate the possibility of a Hg Lab onboard the SA Agulhas II Research Vessel**
- Passive sampling in 5 of the 9 Provinces



# The SA Mercury Network (SAMNet) supported by SA Government

**Statement by SA during GEO Plenary & Ministerial Summit  
GEO Week Nov 2019, Canberra, Australia, committing to GOS4M**



**“The country was also in the process of establishing a regional node for the Global Observation System for Mercury and Digital Earth South Africa, among others”**

**Deputy Minister of Higher Education, Science and Technology,  
Buti Manamela**

- **SA became GOS4M Partner in Dec 2019**

<https://www.dst.gov.za/index.php/media-room/latest-news/2948-deputy-minister-manamela-addresses-earth-observations-summit-in-australia>

Statement by South Africa Mmboneni Muofhe - GEO Principal  
Humbulani Mudau - Head of the delegation and Associate Principal  
Department of Science and Innovation, South Africa  
@ Canberra, Australia  
06 to 07 November 2019

<https://www.earthobservations.org/geoweb19.php?t=statements>

The Director of/ and GEO Secretariat,

Representatives of Member States and Participating Organisations, Associates, Observers, Industry Representatives, Distinguished delegates/Ladies and gentleman.  
South Africa would like to thank the GEO Secretariat, the Australian government and its entities for organising and hosting the 16<sup>th</sup> GEO Plenary and side events. The support of the GEO Member States, Participating Organisations, Associates, Observers and Industry representatives is highly acknowledged. We would like to congratulate new members, with special recognition to the African States that have recently joined the GEO community. We believe that this will truly cultivate and improve the diversity within our membership, which is essential for the fulfilment of our vision to build an operational and functional Global Earth Observation System of Systems. In South Africa is continuously strengthening its efforts towards the realisation of open data access to contribute to the global agenda in addressing major challenges.

**The Cape Point Mercury and Atmospheric Observations is one of the data that South Africa has availed to the global community “GOS4M” (Global Observation System for Mercury), which ultimately contributes to the Minamata Convention.**

AfriGEO Secretariats are realised. We are also looking to leverage on GEO flagship initiatives and collaborate with other regional GEOs to leap frog the implementation of GEOSS in Africa.



# SAMNet Proposal and Work Plan before COVID 19

  
South African  
Weather Service

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**Mercury Monitoring Plan for South Africa and African continent in support of the Global Observation System for Mercury (GOS4M) a GEO Flagship Programme**



Paper prepared for:  
Department of Science and Technology  
Chief Directorate: Space Science and Technology

Paper prepared by:  
Dr. Lynwill G Martin  
SA Weather Service

Certified for  
Excellence

Board Members: Ms Nana Magomola (Chairperson), Adv Derick Block, Dr Phillip Dexter (Deputy Chairperson), Mr David Lefutsu, Mr Jerry Lengosa (CEO), Dr Mphahle Malla, Ms Kelebogile Moroka-Moroka, Ms Sally Muthy-Padayachee, Dr Tshepo Nkomane (DEA Rep), Mr Itani Phaduli, Ms Festwe Renge, Company Secretary (Vacant)

  
environmental affairs  
Department of  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA

CGRS-CC-LETT-09-2019.3



  
South African  
Weather Service

**Project Work Plan**


**for the**

**South African Mercury Network (SAMNet)**

**1 April 2020 – 31 March 2022**

Certified for  
Excellence

Board Members: Ms Nana Magomola (Chairperson), Dr Phillip Dexter (Deputy Chairperson), Adv Derick Block, Mr David Lefutsu, Dr Mphahle Malla, Ms Kelebogile Moroka-Moroka, Ms Sally Muthy-Padayachee, Dr Tshepo Nkomane (DEA Rep), Mr Itani Phaduli, Ms Festwe Renge, Mr Minkell Ndabambi (Acting CEO), Company Secretary: Ms Thandi Zide

  
environmental affairs  
Department of  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA

CGRS-CC-LETT-2020.1





# Objectives of SAMNet Phase 1

- .The overall goal is to develop a **coordinated SA (later in Africa through AfriGEO) observation network for mercury** to determine the status and trends in atmospheric mercury concentrations as well as wet, dry, and total atmospheric deposition of mercury;
- .Provide high quality data for the validation of local and regional model input;
- .Assist partners in developing their mercury monitoring capacity by providing training on multi-media (e.g., air, soil, precipitation) sampling and analytical methods;
- .Give government and relevant stakeholders a firm basis for future policy developments in the implementation of the Minamata Convention



# SAMNet Phase 1 Work Packages

	WP Title	Lead Partner	Start month	End month
WP1	Coordination & Governance	SAWS	1	24
WP2	Ground based observations	SAWS	3	24
WP3	Wet Deposition Network	SAWS/NWU	3	24
WP4	Mercury Reference Laboratory	CSIR	3	24
WP5	Atmospheric Hg Modelling	UZ	3	24
WP6	Online System Tools	CGS	10	24
WP7	Human Capital Development	ALL	1	24
WP8	Dissemination	SAWS	6	24



# Ground Based Observation WP2: Establish 3 new Hg Stations

.Possible Locations of new SAMNet Sites will be tabled before PSC on 22 Oct for final Decision

.**De Aar** (inland background site no industrial activity 200km radius)

POP's through GAPS Network since 2009

MERPas since July 2019 deposition of mercury

.**Kimberley** (mining activity diamonds, steel, Iron, Zinc, Chrome)

MERPAS since Jan 2020

**Welgegund Atmospheric Station** (Regional Monitoring Station 100 km from Johannesburg)

Deposition Sampling DEBITS Network

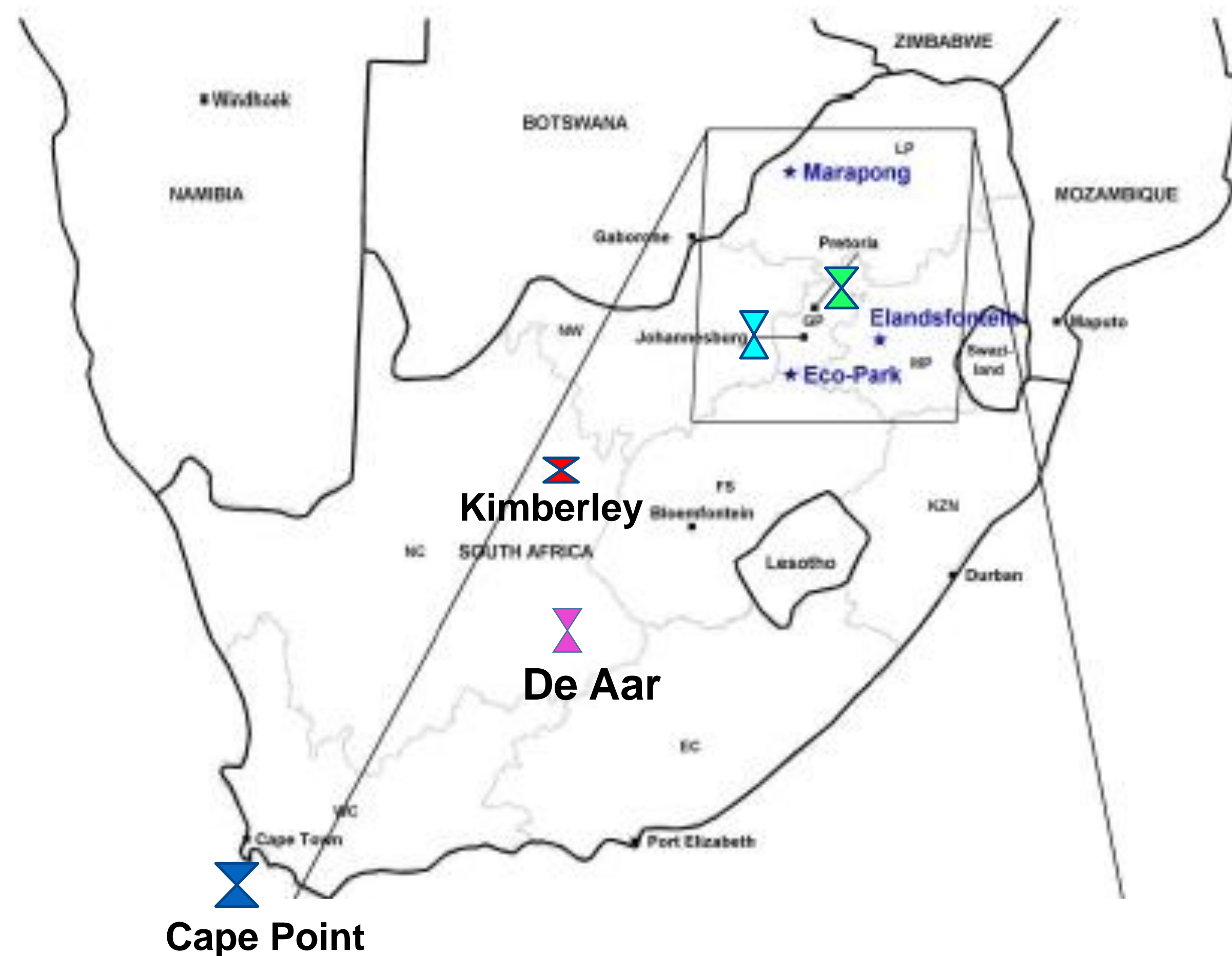
TGM with Tekran since 2015 stopped in 2018

**Irene GAW Regional Station** (Upper Air measurements, Dobson since 1989)

**Air Quality Station in High Priority Area** (close to power plants, hotspot)



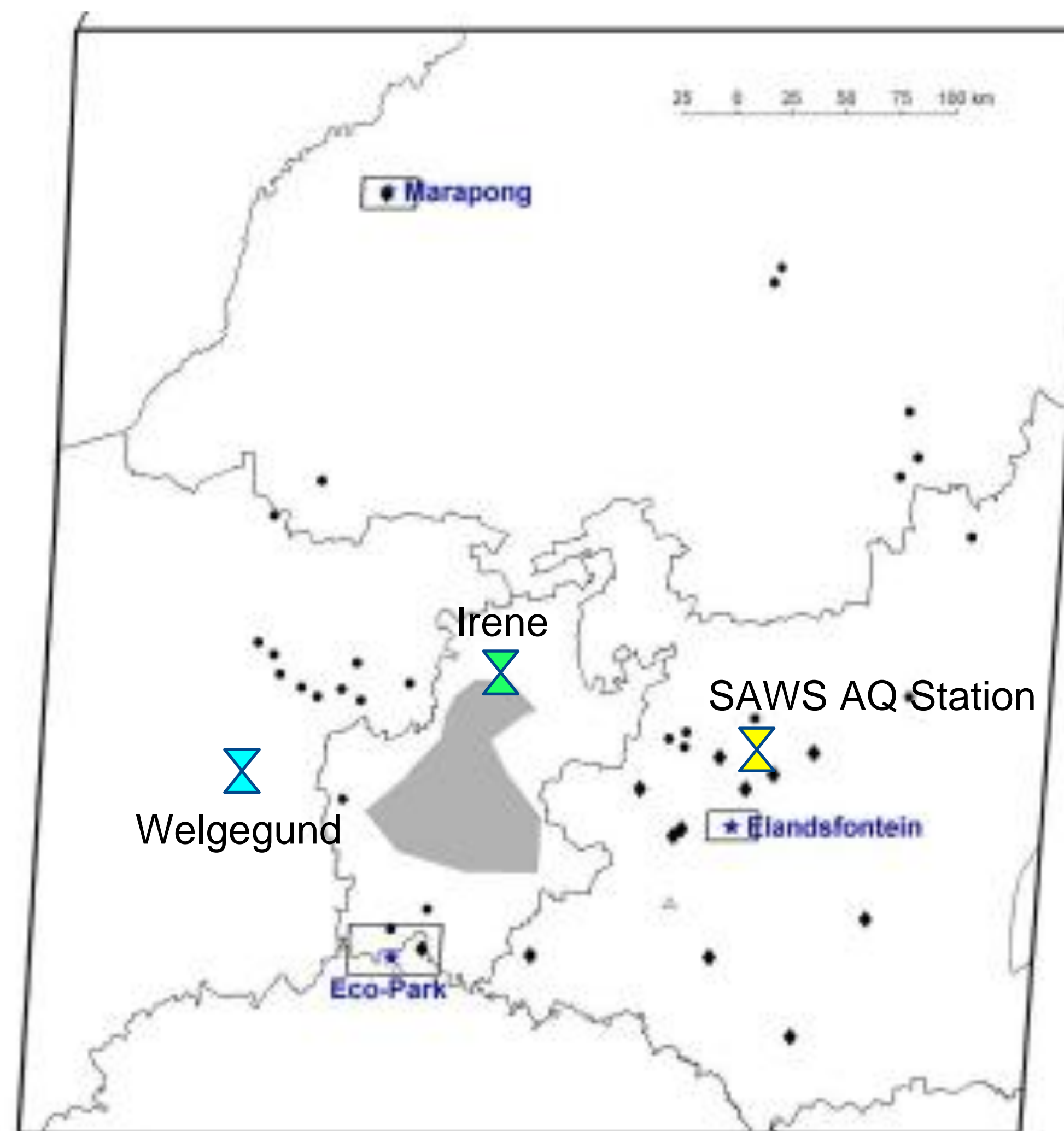
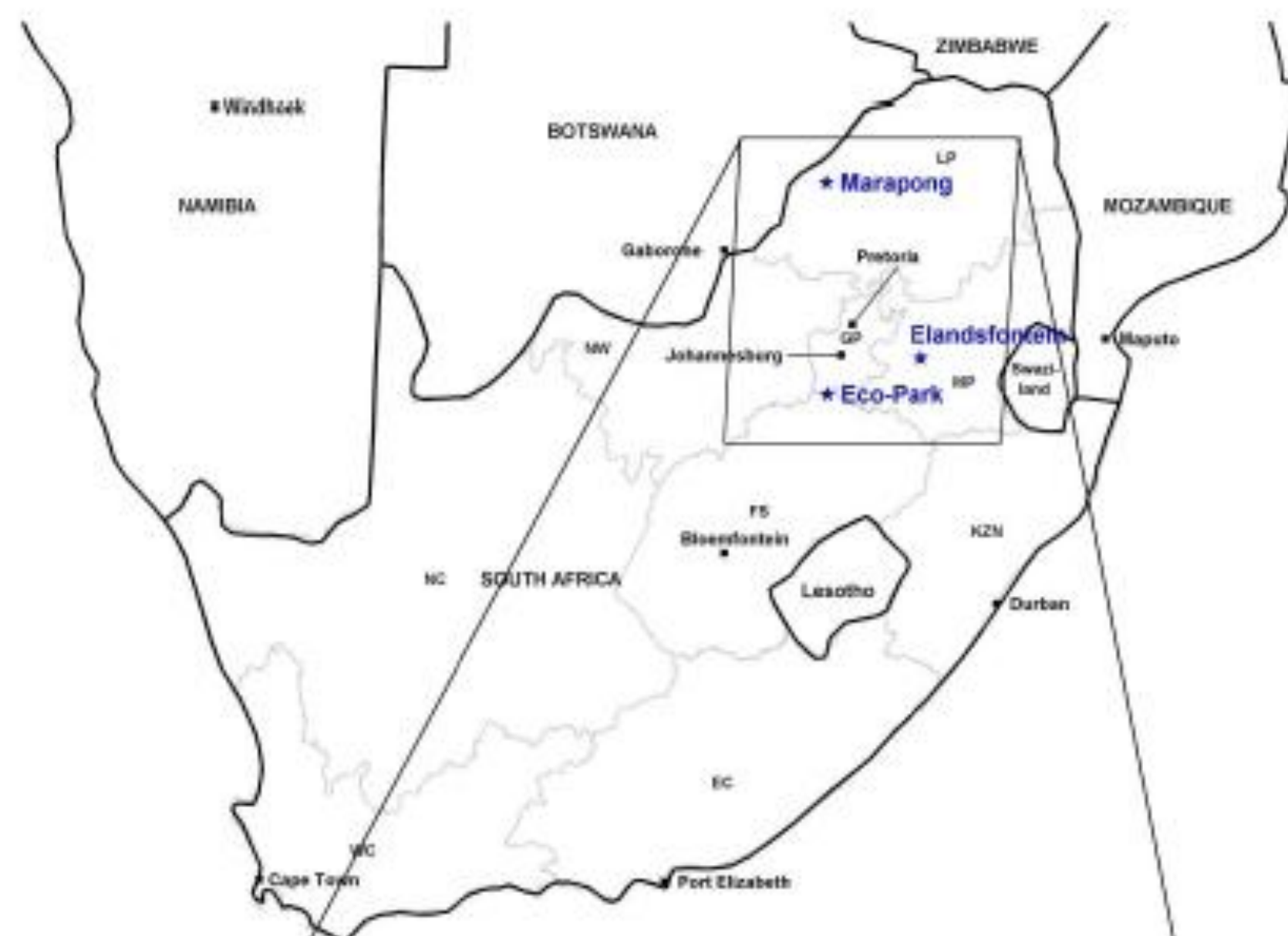
# Possible SAMNet Sites for monitoring stations



- Blue 'X' symbol: GAW SITE
- Purple 'X' symbol: POPs GAPS Network  
MerPas ECC-Canada
- Red 'X' symbol: MerPas ECC-Canada  
Close to Airport
- Green 'X' symbol: GAW Regional Station
- Cyan 'X' symbol: Welgegund (TGM 2014 – 2018)



# Possible SAMNet Sites in Highveld Region of SA



**Need to decide between Irene and AQ-Station**



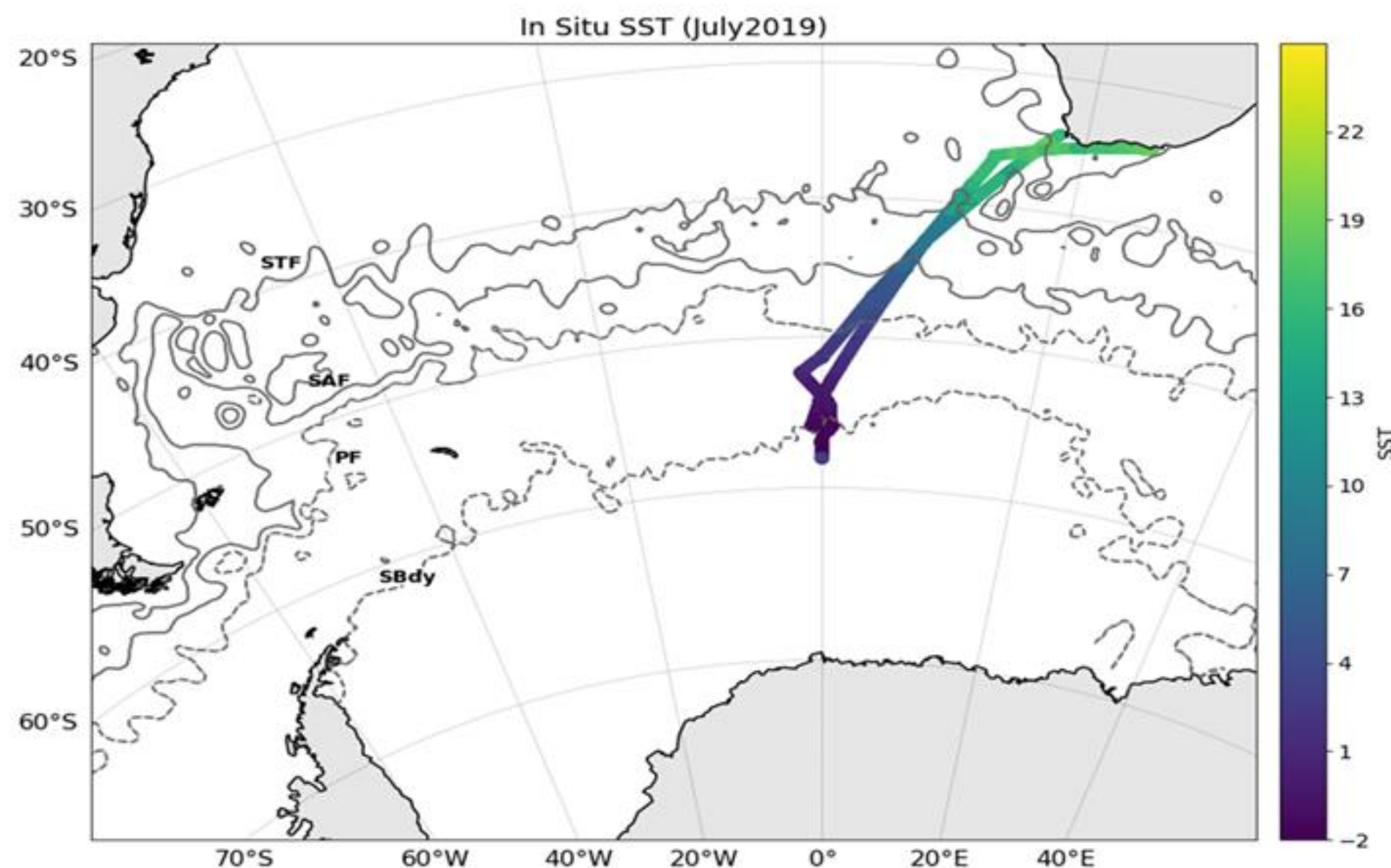
# SAMNet Wet Deposition Sites in W-Cape using Air Quality Stations

-  Saldanha Bay
  -  Cape Point GAW
  -  Worcester
  -  Stellenbosch CSIR
  -  Mossel Bay
  -  City of Cape Town
- N-CON & in-house samplers  
based on DEBITS Rain  
Collector**





# Ocean Cruise on SA Agulhas July 2021



SCALE Winter Cruise

**S**outhern o**C**ean se**A**sonal **L** **E**xperiment

18 -21 day cruise (July –Aug yearly)

Scientific cruise around 100 researchers

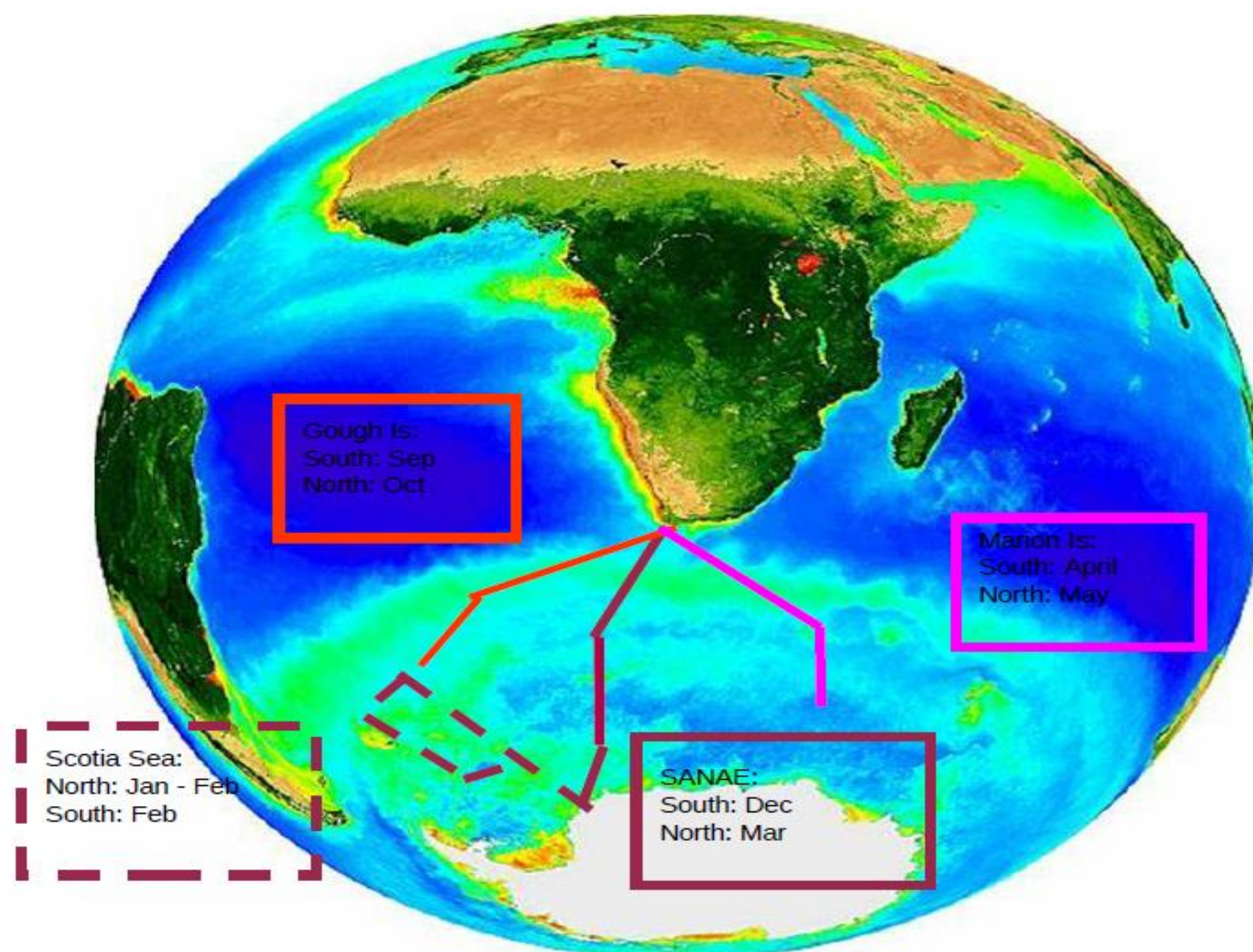
Till the ice in Antarctic region





# 3- Stop Ocean Cruise on SA Agulhas Sep 2021

## In Situ Observations



SA Agulhas



# Conclusions

- .SAMNet Phase 1 a 2-year project to expand the Hg monitoring infrastructure in SA
- .3 New Ambient Sites (Lumex & Tekran Monitors) **De Aar, Welgegund** and .....
- .5x Wet Deposition Site (NCON and in-house rainwater sampler)
- .Capacity Building, training of Site operators
- .Expand SAMNet into Africa through GEOAfrica Platform





## 15<sup>th</sup> INTERNATIONAL CONFERENCE ON MERCURY AS A GLOBAL POLLUTANT

CAPE TOWN | SOUTH AFRICA | 24-29 JULY 2022

[www.ilmexhibitions.com/mercury2022](http://www.ilmexhibitions.com/mercury2022)





**BAIE DANKIE, ENKOSI, THANK YOU**