Atmospheric modelling over South Africa

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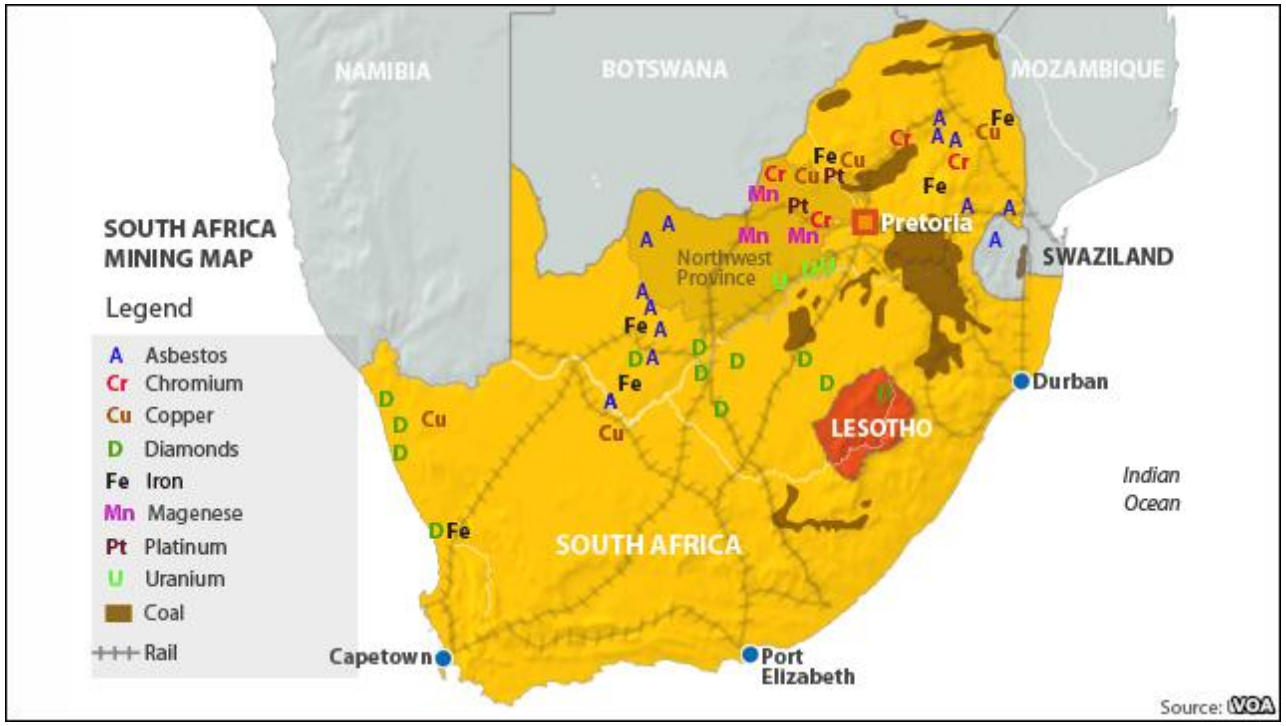
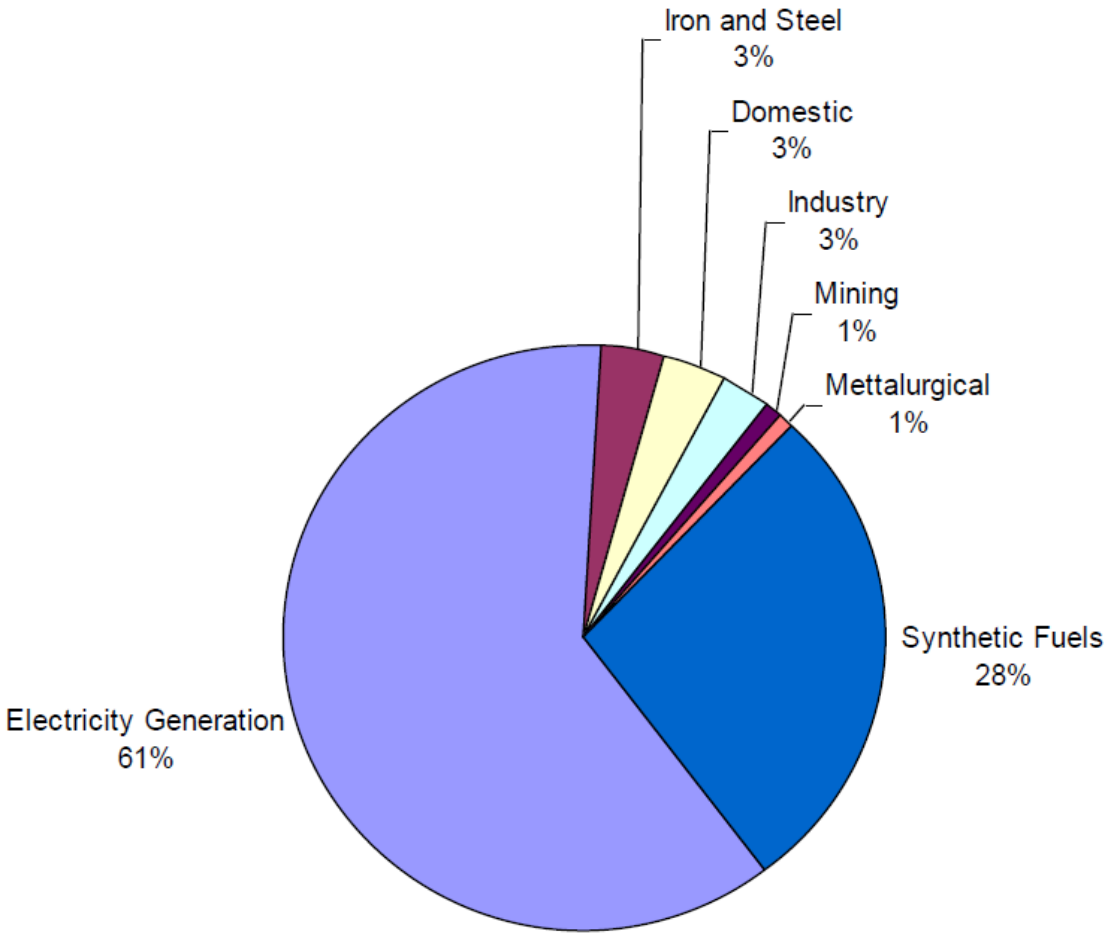
Introduction

- South Africa relies on coal as a primary source of energy. Thus, an increase of Mercury concentration in the atmosphere is expected.
- Most households in townships also burn coal for heating and cooking.
- Previous studies have reported South Africa as the 2nd largest contributor to total global Mercury emissions (e.g. Pacyna et al, 2003, 2006).



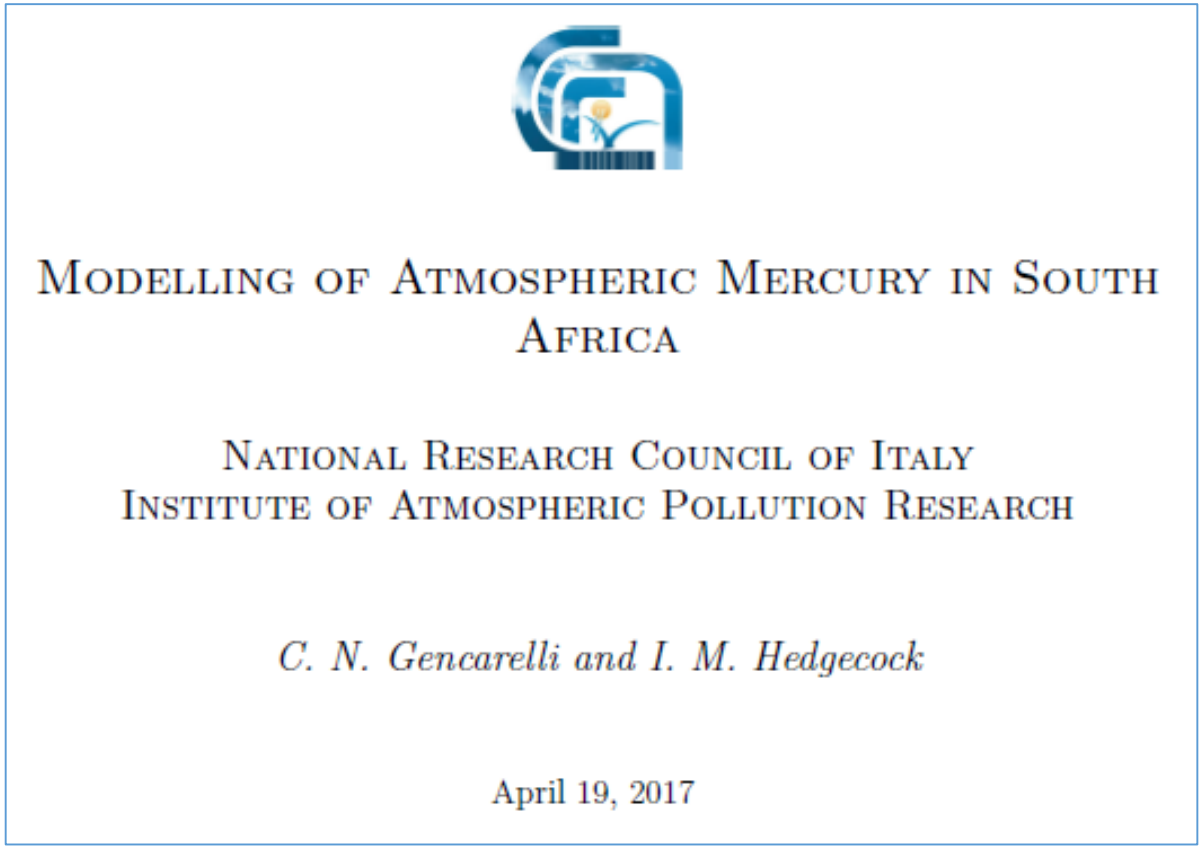
Source: https://www.jxscmachine.com/new/south-africa-mineral-resources/

Consumption coal in South Africa (DME, 2004)



Source: https://www.powermag.com/whistling-in-the-dark-inside-south-africas-power-crisis/

Year 2017 important report presenting modelling of atmospheric Mercury using WRF-Chem



MODELLING OF ATMOSPHERIC MERCURY IN SOUTH AFRICA

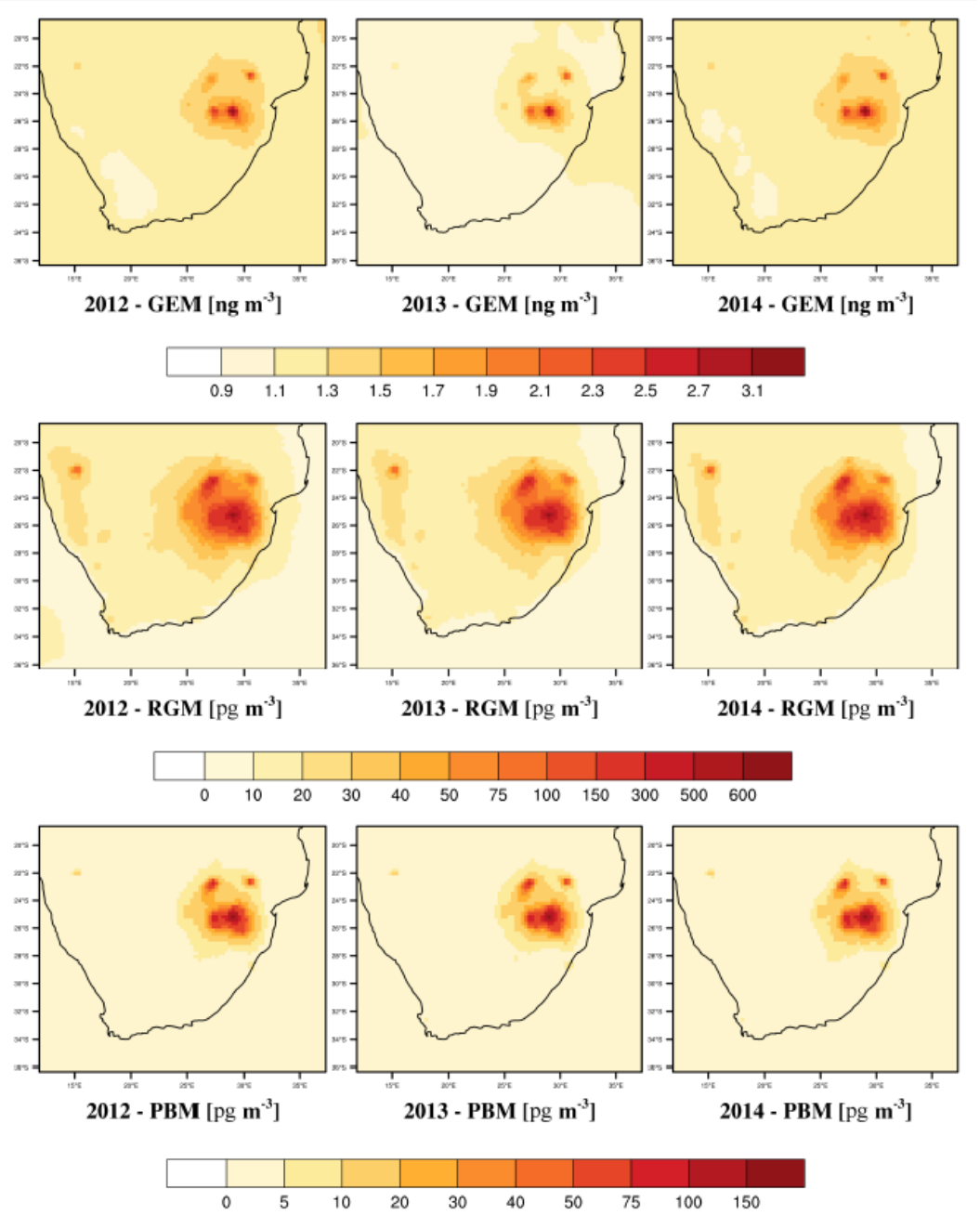
NATIONAL RESEARCH COUNCIL OF ITALY
INSTITUTE OF ATMOSPHERIC POLLUTION RESEARCH

C. N. Gencarelli and I. M. Hedgecock

April 19, 2017

In this report, they performed:

- Total deposition
- Monthly compound ground level air concentrations
- Deposition according to Climate Zone
- Local and long-range transport contributions to Hg concentrations

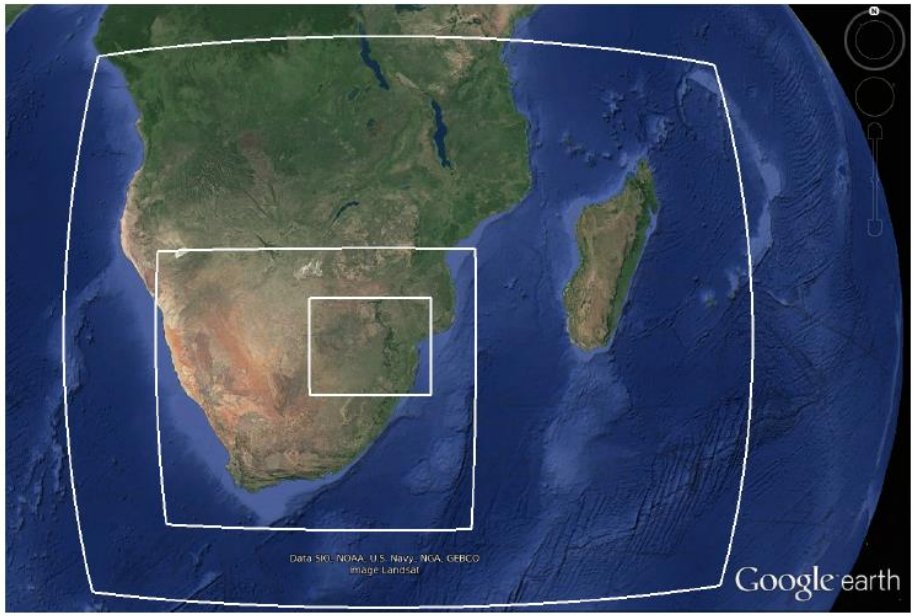


Modelling atmospheric mercury over SA

Annual mean concentrations of GEM, RGM and PBM for the years 2012, 2013 and 2014 in the Base-AMAP" simulations

These maps highlights how impacted the Highveld region is.

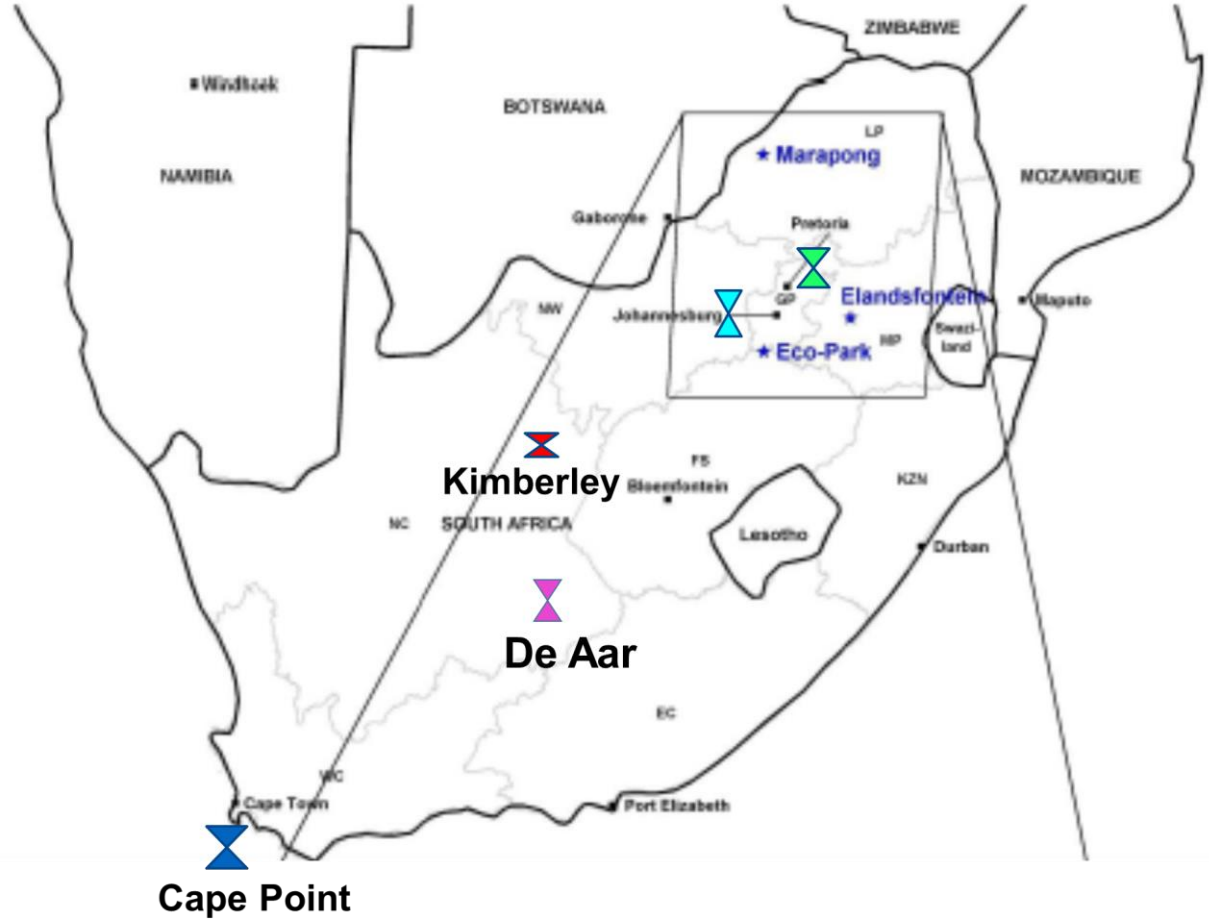
Domain used in the "Modelling of atmospheric Mecury over South Africa Report"



Establishing new sites for modelling through the SA Mercury Network (SAMNet)

- SAMNet Phase 1 (started1 April 2020) is a 2-year project funded by Dept. Science & Innovation
- DSI the focal point for SA within GEO and SAMNet is SA's contribution towards GOS4M
- **For Phase 1 the following are key deliverables**:
  - Establish 3 new Hg ambient stations.
  - 5 New Wet deposition sites throughout the country
  - Passive sampling at key hotspots and in provinces to improve spatial coverage
  - Infrastructure upgrade at Cape Point (Tekran Speciation Unit)

New Ambient Hg Monitoring Sites in SA for Modeling



Cape Point

De Aar (New)

Kimberley (New)

Witbank Air Quality Station (New)

Welgegund Measurement Station

(GEM since 2014 - 2018)

Cape Point, De Aar and Kimberley is part of the Global Passive Sampling Pilot Project Coordinated by Environment and Climate Change Canada.

Planned modelling work for South Africa:

1. WRF-Chem and CMAQ to be used **with data from Cape Point and new SAMNet sites**
2. We have already setup WRF in our workstation and we have already done WRF small experiments.
3. Centre for High-Performance Computing logging in details already granted for free.
4. Soon we are going to be starting several model experiments in order to assess the impact on the simulation results.
5. The plan is to also include other African Countries in the future (e.g. Congo, Zambia, Zimbabwe …)