

Photo: Guy
Williams, western
Ross Sea (NBP17-
04)

Antarctic sea ice monitoring to better predict the effects of climate change

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South Africa

Contents

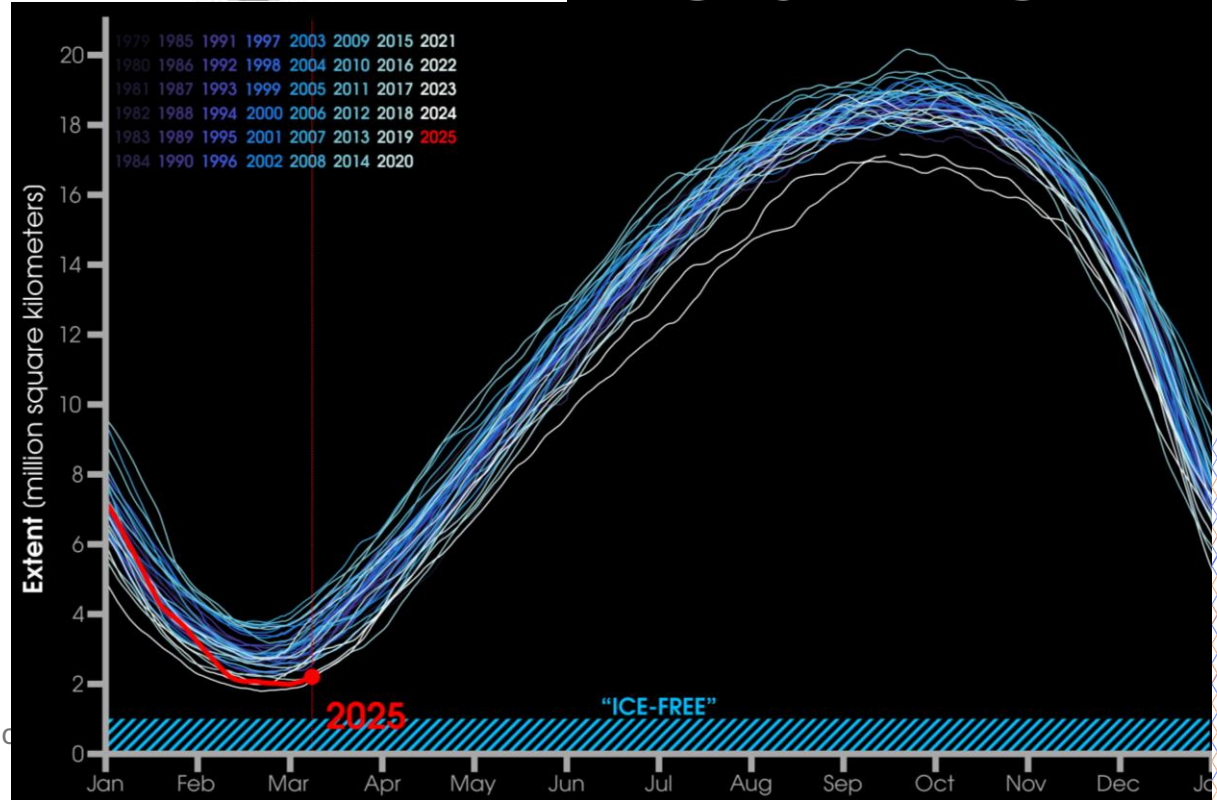
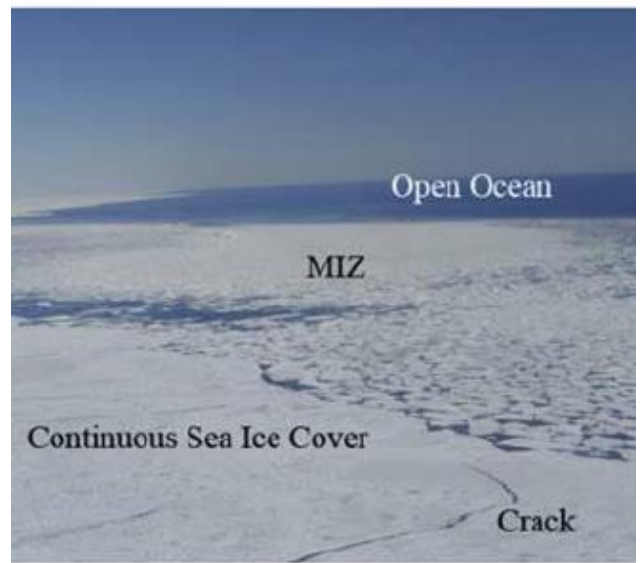
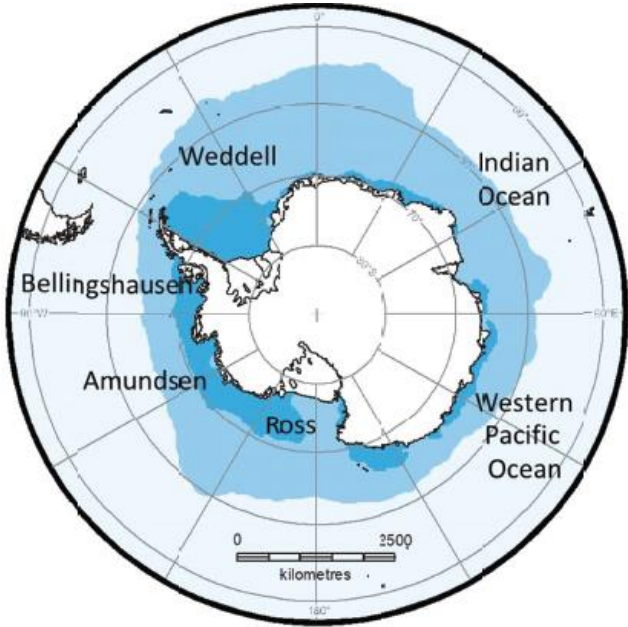
1. Background
2. Need
3. Proposal overview
4. Implementation
5. Conclusion



Antarctic sea ice and its importance

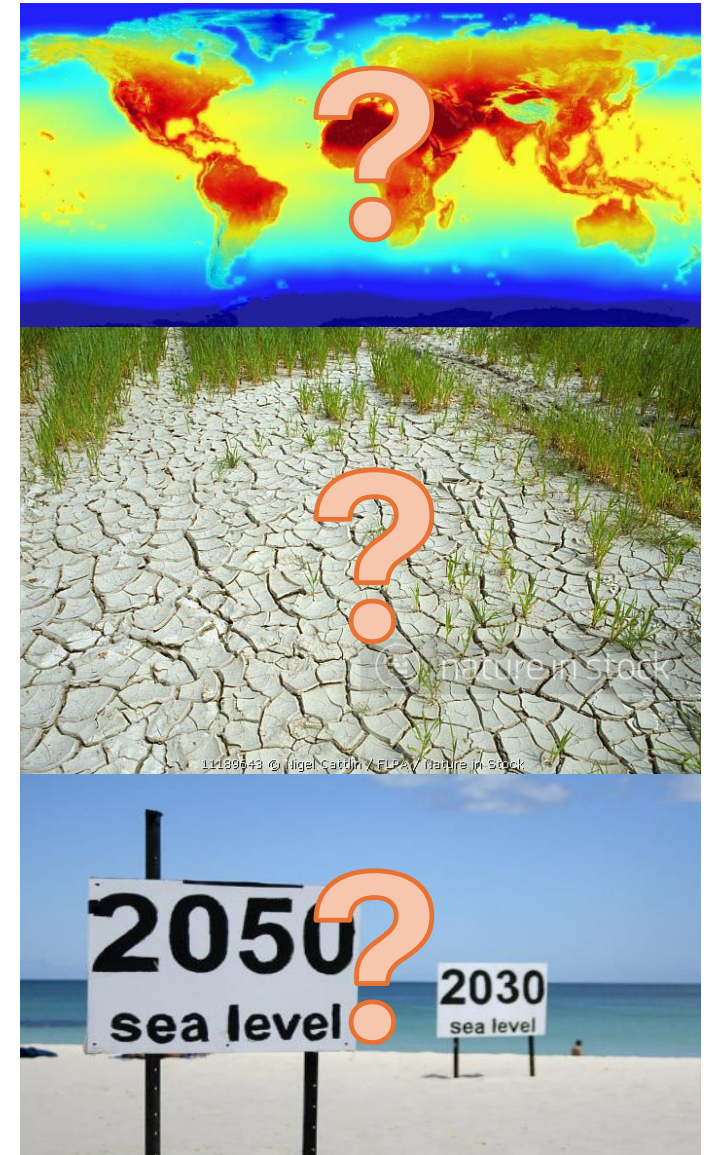
- Sea ice zones are important!
 - Covers up to **10%** of sea surface
 - Reflects solar rays
 - Protects Antarctic ice shelves from waves

- Undergoing a drastic change.
 - Drastic drop from previous growth
 - Predicted disappearance of ice
 - Could prelude massive climate impacts



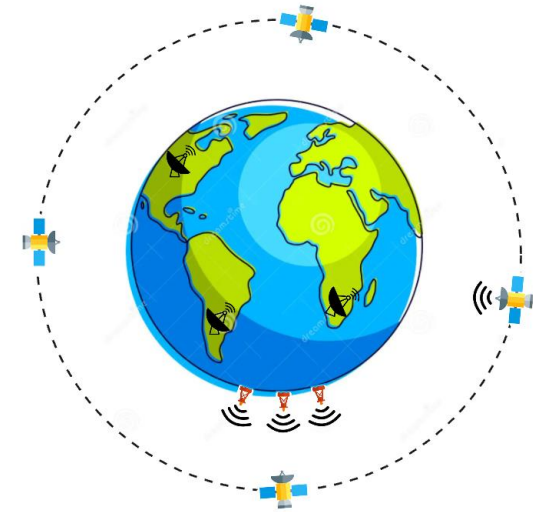
Need for on-the-ground data

- Massive effects on global weather
 - Not very well monitored
 - Localized
 - Sporadic
- EO data and weather models rely on in-situ data samples
- Uncertainty is a killer
 - We cannot make arguments for climate change prevention and preparation with such large margins of error.



Proposal

- Network of IoT buoys floating in Antarctic sea ice zone
 - Dispersed (< 1 every 1000 km²)
 - Obtain in-situ data to supplement EO observations
 - Utilize mesh network to efficiently upload sensor data
 - Perform year-round data sampling



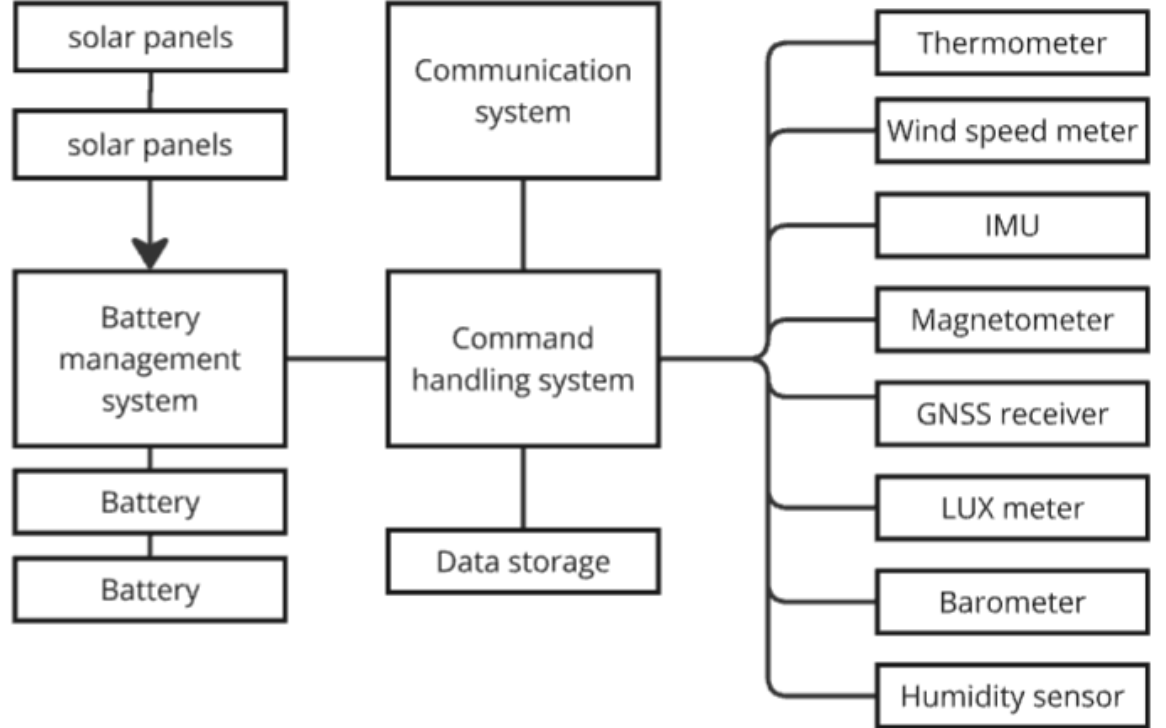
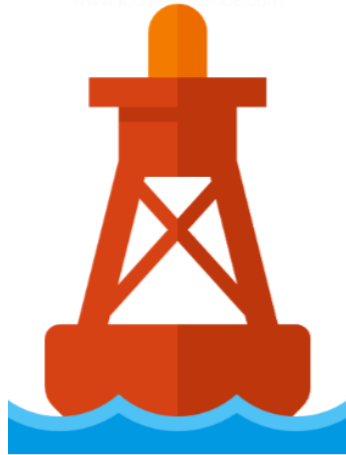
- Constellation in high inclination?
 - **Expensive ~ thrusters**
 - **Less coverage**
 - **Will cover important upcoming geo-political and scientific regions**

| | Coverage (% of total time) | | Average period until next flyby (hr) | |
|--------------------------|----------------------------|------------|--------------------------------------|------------|
| | 51,6° | 97° | 51,7° | 97° |
| Rome, Italy | 4,4 % | 2,5 % | 3,3 | 5,5 |
| Kinshasa, Congo | 2,5 % | 1,9 % | 6,3 | 7,6 |
| Ice zone (68°S, 22°E) | 1,2 % | 6,7 % | 11 | 2,0 |
| Antarctica (85°S, 135°E) | 0 % | 10 % | NA | 1,3 |

Ground segment

- Buoy design
 - Many challenges to implementation
 - UNISEC members with Antarctic research groups can help
 - Great opportunity for collaboration

- Downlink ground stations
 - South Africa, New Zealand, Argentina
 - Antarctica & research vessels



Implementation – South Africa as a collaborator



- South Africa has:
 - Universities with experience building satellites
 - World class CubeSat companies
 - Supporting government institutions
- Invite our neighbouring countries to collaborate
 - Capacity building – your students will actually build the satellite
 - Foster meaningful international collaboration
 - Cheaper – possible financial incentives



Conclusion

- This is an amazing opportunity.
- If we can work together, in our own countries and as a community, the only outcome can be success.
- Thank you!
- Any questions?
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