Sustainable observations in extreme conditions

Andrew Harper

andrew.harper@niwa.co.nz

TECO 2018, Amsterdam, 8-11 October 2018

Climate, Freshwater & Ocean Science

Why do we need reliable and quality observations?

- To produce reliable forecasts and warnings to protect lives, infrastructure and livelihoods
- To produce warnings and climate services for disaster risk reduction and climate change mitigation, e.g. drought forecasts, seasonal outlooks…
- High resolution models require high quality and quantity observations
- To support climate science programmes e.g. GSRN

WMO statement on state of the climate in 2017

System design

User requirements

Fit for purpose(s)

- Aviation
- Marine
- General forecasting
- Warnings
- Climate services
- Climate science
- What to wear…

System design

Suited for the environment

Location

- Extreme weather events
- Harsh environment
- Vandalism
- Frequency of visits
- Spares and consumables
- Qualified technical staff
- Operating/maintenance costs
- How much for a one-off visit?

What can we do about the extreme events?

Degradation?

Robustness of station design is vital to ensure the sustainability of quality observations.

Designing such a system requires significant investment not only in the procurement and installation processes, but also in the ongoing resourcing (human and financial) to maintain the reliability of observations.

May need compromises to get the most cost-effective systems in place. Must not be greater than what is required to ensure provision of reliable observations, particularly in remote locations or those that experience extreme events.

The neutral tender (generic AWS tender specifications) documents provide excellent guidance on the entire process from an analysis of user requirements through to lifecycle management.


Mueller Hut
Campbell Island
Scott Base
Image U.S. Geological Survey
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2018 Google
US Dept of State Geographer
Google Earth

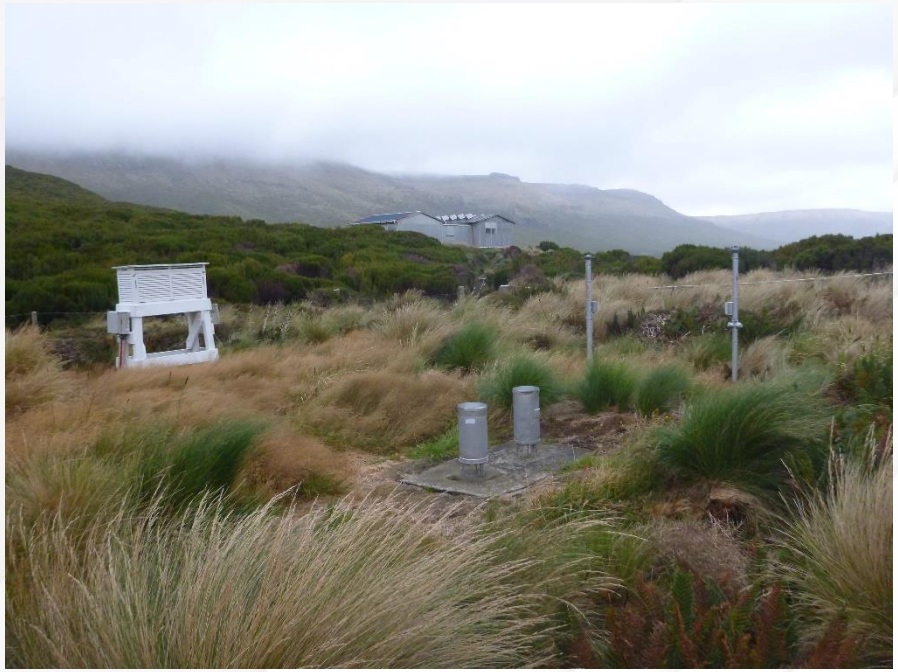
1. Scott Base, Antarctica

- 20days >51kts (20 m/s)
- -57.0 to 6.7 °C
- Manned
- Manual and auto observations
- Ethernet

NIWA
Taihoro Nukurangi

2. Campbell Island, New Zealand

- 660 hrs sunshine
- 108 days > 51kts (20 m/s)
- Sea lions and Elephant seals
- Unmanned
- Duel system
- Himawari-8



NIWA
Taihoro Nukurangi

Meanwhile in the tropics…

NIWA
Taihoro Nukurangi

Mueller Hut, New Zealand

- 20 days > 51kts (20 m/s)
- 6 - 10m precipitation
- Unmanned
- Solar and fuel cells
- Inmarsat
- Wildlife

NIWA
Taihoro Nukurangi

Some considerations

- Flooding
- Strong winds/gusts
- Sand storms
- Heavy snow
- Icing
- Limited solar power
- Volcanic ash

- Inquisitive birds
- Rodents
- Large animals such as cows, pigs, bears
- Humans!

- Quality observations are required
- Quality instruments and systems are required
- Large resources (human and financial) required to sustain observations in extreme conditions

Whole of lifecycle needs to be planned for and managed (HMEI/WMO tender spec)

Thank you