Sustainable observations in extreme conditions

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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

Climate, Freshwater & Ocean Science
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<th>System design</th>
<th>System design</th>
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<td>User requirements</td>
<td>Suited for the environment</td>
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<tr>
<td>Fit for purpose(s)</td>
<td>Location</td>
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<td>• Aviation</td>
<td>• Extreme weather events</td>
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<td>• Marine</td>
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<td>• General forecasting</td>
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<td>• Warnings</td>
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<td>• Climate science</td>
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<td>• What to wear…</td>
<td>• Operating/maintenance costs</td>
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<td>• How much for a one-off visit?</td>
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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.
1. Scott Base, Antarctica

- 20 days >51kts (20 m/s)
- -57.0 to 6.7 °C
- Manned
- Manual and auto observations
- Ethernet
2. Campbell Island, New Zealand

- 660 hrs sunshine
- 108 days > 51kts (20 m/s)
- Sea lions and Elephant seals
- Unmanned
- Duel system
- Himawari-8
Meanwhile in the tropics…
Mueller Hut, New Zealand

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