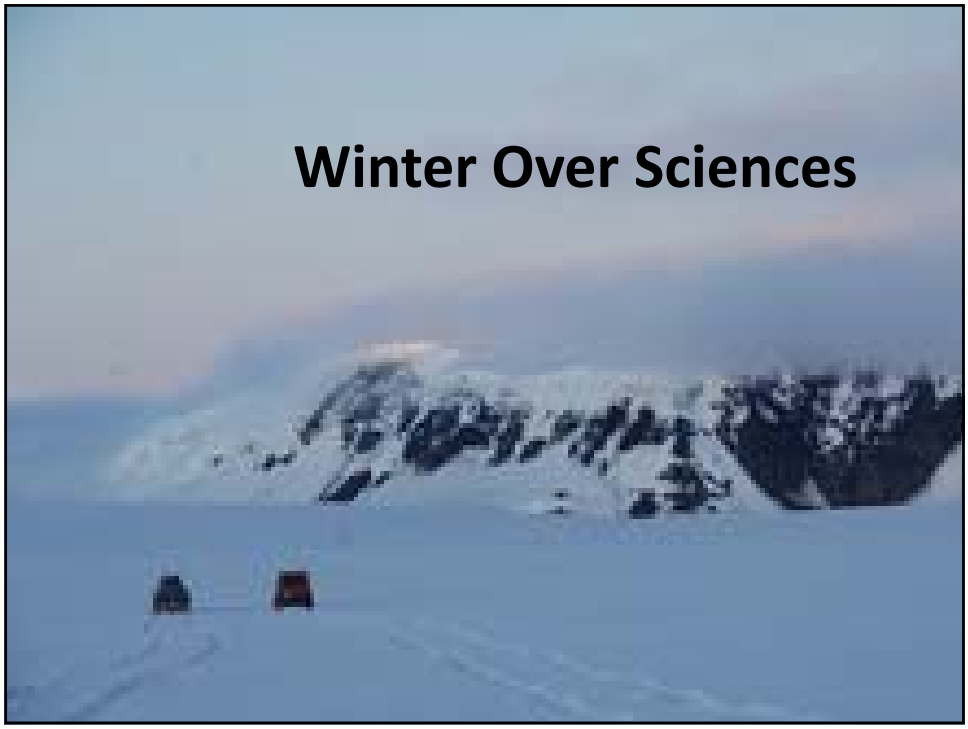
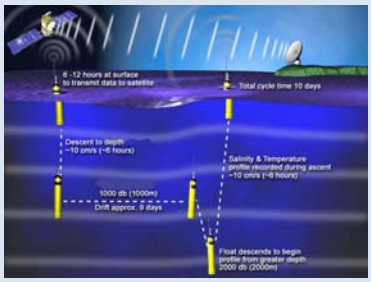
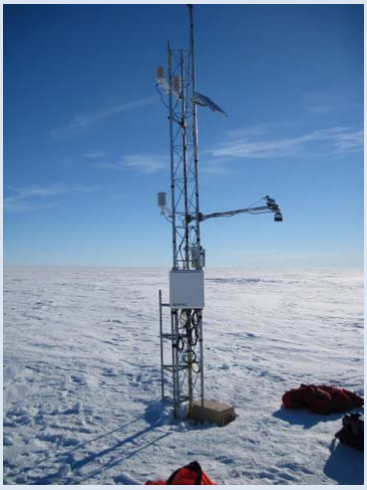
Winter Over Sciences



Winter Over Sciences – Heroic A

Technological Work





Pre-Workshop Questions

- What science could be done by station personnel?
- How could we improve science experiments during winter and in the transition period? What would be required from a modern work environment to conduct a year-round deep field science experiment?
- What technical advances could help us to conduct science remotely from the comfort of our offices and improve the spatial and temporal coverage year round?

- What science could be done during the summer winter transition period?
  What science could we be doing during the winter months?

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- What kind of measurements would we like to extend over a longer period of the year (including winter)?
- What kind of work are we currently not doing because it is too difficult?
- What are the difficulties and what would be needed to overcome those difficulties?
- What are the reasons for not conducting science in winter?

Workshop Notes

Introduction

- Stefan Vogel
  - Environmental Processes – need for year round measurements
  - Inspirational previous work conducted year-round IGY-1990th
  - Over ice traverses, Amery Ice Shelf winter-over campaign 1968 – repeat in the future?
- Wolfgang Rack
  - Extending time series winter measurements validating remote sensing
  - Winter over - energy requirement
- Roland, Warner
  - Highly capable Winter over staff available for science work
  - Lower pressure on resources.
  - Atmospheric science example of winter over science
  - Glaciology, early spring late fall work.
- Barbara Frankel modernisation group previous Glaciology
  - Shipping, station, traverse capability
  - Scientists NOT to make assumption on what can or can't be supported.
  - Bring on big ideas, and work with logistics on what could be feasible.
- Science teacher
  - Career for students to get involved in science
  - Technology available to connect with Science
  - Outreach opportunities

Reasons for Winter Over Science

- Winter Science Gaps
- Winter Science processes
- Strategic Reason
- Resource availability

Science Gaps

- What can we measure in Winter What we can't in summer?
- Time series in meteorology, climate processes, mass balance, ocean, ice ocean interactions, atmosphere
- Questions about seasonal processes example: grounding zone processes impact of seasonal changes of subice shelf processes on ice dynamics.
- Snow net accumulation, seasonality, linear vs. periodic process, deposition/removal processes, firn densification
- Ecosystem processes
- Fastice, Seaice work summer melt hazard and environmental change

Resource Competition

- Winter currently less demand
- Engineering problems with summer melt and melt evolution through year.
- Impact of melt on summer operation. => winter early/late season work would avoid such problems

Problems with Winter Over Science

- Environmental conditions
  - Impact on humans
  - Impact on equipment
  - SAR
- Access to Antarctica
- Societal expectations
  - Expectations/choice of frequent visits, short-term deployments.
  - Not as heroic/family commitments,
  - Difficult to attract staff for longer term deployments
  - Expectation for scientists to work in office/University job requirements, => opportunity for early career scientists
  - Out of habit
  - Risk averse, Operational Health Safety

Station Based vs. Remote Science

- Conducting work during Winter or Summer only important for processes involving seasonality. No scientific reason for for example for radar traverse.
- Equipment operation issues are less in summer than in winter.
- Glaciology Station work:
  - Station is only a hub, shelter, resource, provides access to field
  - Davis station easier access to ice sheet or glacier environment travel over sea-ice.
  - Remote deep field winter over work???
    1968 winter over on Amery Ice Shelf

Current Winter Over Science - Improvements

- Scientists in part un happy with current winter over tasks at Station
  - In part looked at as optional work
  - Experience with designing work so that it can be done in winter,
- =>
  - Management Issue – Resource, project risk assessment
  - Planning issue

- What determines numbers of beds on station in winter?
- Paradigm regards to wintering
- Inspiration for outreach activities,
- Special having live feed from Antarctica in winter
- Opportunities for winter over science through collaboration with other national programs
  - Access to specific locations for specific reasons

- Challenge to location of permanent Stations => semi permanent Stations
- Winter over science usage at a station dependent on the environment/surroundings and the science questions addressable in mid winter from the station, access also plays a role.
- NZ-Winter Science Team/technician
- Australia AAD positions for technical support, ?University based winter over science project (bed on station)

People based Winter Over Science Work

- Technical support
- Science

Examples of Winter Over Science

- Outside of summer season.
- Mawson Ablation Stake network
- GPS, ice dynamic stake network
- McMurdo Sound Sea-ice work
- Davis Station Fastice,
- Support/maintenance of high power equipment (GPS, Radar, DTS system…)
- UAV + AUV operation
- Year round borehole work on ice shelf
  - Water sampling, and time critical analysis
  - direct human interactive observations
  - ROV operations

Technological challenges for automated winter over sciences

- Biggest challenge:
- Power consumption
- Equipment robustness:
  - Temperature range
  - Wind loading
- Annual maintenance visit, logistical, burial,
- Risk management, redundancy …

- Examples NZ-sea-ice work, winfly
- US extended season work in Dry Valleys
- Previous glaciology traverses which started early season after winter overing.

How can we improve Synergistic activities with other groups

- Ocean Observing Systems
- Terrestrial Near Shore Observing Community
- Bio-Cryosphere-Ocean linkages