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?
• 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 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 unhappy 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