Use of Weather and Climate Information: Risk perception and decision-making in the Antarctic

Principal investigator

Victoria Heinrich
vjheinrich@hotmail.com
University of Tasmania

Other contact
+61438363208

Areas of contribution

Education
Outreach
Societal and/or behavioural aspects

Summary

The research for this PhD project will focus on the use of weather and climate information to inform best practice and education in decision-making relating to human health and the environment in Antarctica. A mixed methods study including surveys and interviews is planned. The findings may be used to educate users and promote best practice decision-making. It will contribute to the development of an Antarctic weather information value-chain and salient weather and climate products. It will help mitigate health and other risks associated with human activities in the Antarctic through improved risk perception, communication, and informed decision-making.

Aim 1: Investigate user and expert metacognition around the use of weather and climate information in the Antarctic.

Research Questions:
1. How do people use the weather, climate and other environmental information in their decision-making in the
Antarctic?
2. How do users interpret, understand, and integrate weather information; how accurate is their understanding of their thought processes; how do they compensate for poor information, lack of knowledge or misunderstanding?
3. How can we improve users’ risk judgements and decision-making processes (metacognition)?

Aim 2: Defining the Antarctic weather information value chain.
Research Questions:
1. What services and weather information do users find most useful?
2. What are the major constraints to their use of weather and climate information?
3. Where do users’ believe future investment and collaboration is needed for weather and climate services that give the most value for money and reduce risk?
4. Do users consider climate change in their strategic planning?

Description

Decisions made in the Antarctic can have far-reaching consequences due to the increased risks associated with the remoteness, harshness, and fragility of the environment. Access, transport, and technological infrastructures are limited, constraining resources, search and rescue efforts and the ability of weather services to observe, predict and deliver polar weather compared to other parts of the globe. This is exacerbated when knowledge deficits, inexperience with the Antarctic climate and weather, and poor risk communication leads to poor risk perception and poor planning where people are unprepared and caught unaware by hazards, have inappropriate equipment, and may lack contingency plans. This leads to incidents like the MV Akademik Shokalskiy rescue (Australian Antarctic Division, 2014) and the Davis helicopter crash (Australian Transport Safety Bureau, 2015), damaged equipment, adverse environmental impacts, operational delays, injury, and even death. The unique motivations and considerations of the Antarctic Treaty system provide additional operational differences. New or improved weather services are not beneficial in a societal sense if the potential users do not understand the information, find it irrelevant, or do not use it. Human behaviour is complex, with many factors influencing risk perception, decision-making, and communication. Users’ perspectives, other non-weather factors, and constraints influence decision-making, leading to a unique context for each decision (Dawson et al., 2017; Morss et al., 2008). Psychology can aid in understanding how people use, interpret, and respond to weather information, thereby improving people’s comprehension and use of information. Improved user involvement and collaboration in research and product development is likely to increase user engagement and use of weather services and thereby increase the community value of the service and mitigate risks. This aligns with the concept of an interactive forecast system (Morss et al., 2008; Morss, Wilhelmi, Downton, & Gruntfest, 2005; Parsons et al., 2017), the objectives of the WMO (2014) and the PPP-SERA (Dawson et al., 2017) and the UTAS Better Health and Marine, Antarctic and Maritime research themes. A mixed methods research design is planned where qualitative (written and spoken words) and quantitative (numerical) data sets are collected, interpreted and integrated through triangulation or convergent design (Braun & Clarke, 2013; Creswell, 2015). Combining quantitative and qualitative data provides a better understanding of the research questions than is gained by using either data set alone (Creswell, 2015). Research methods that may be utilised in this study include metacognition modelling and qualitative interview methods such as the mental models approach from risk communication (MMARC, Gary & Wood, 2016; Morgan, Fischhoff, Bostron, & Atman, 2002), the IDEA (“Investigate,” “Discuss,” “Estimate” and “Aggregate”) protocol (Hemming et al., 2018), thematic analysis of interview data (Braun & Clarke, 2013) and surveys. The theoretical perspective is based on compensatory vs non-compensatory decisions, metacognitive accuracy, metacognitive judgements, and social cognitive and behavioural theories. To provide an international perspective and capture the unique nature of the collaboration and scientific research under the Antarctic Treaty, participants will be sought from the Australian and other
countries’ National Antarctic programs that operate and conduct research in the Antarctic. The purposeful selection of participants will include ‘experts’ such as the professionals from weather services providing and interpreting weather information in the Antarctic and the ‘users’ such as the Antarctic logistics providers and planners who are the Station Leaders, Operations Coordinators, Program Leaders, and Field Leaders. These are the people who use weather and climate information in their day-to-day and seasonal operational decision-making and long-term planning. Additional users include aviation providers, tourism providers, fisheries, Defence, Tasmanian Parks and Wildlife Services, and not-for-profit organisations. Surveying Antarctic expeditioners from any National program allows for a larger sample size, thereby facilitating a broader range of quantitative analyses. By ensuring that the participant sample spans multiple programs and seasons (including both summer and winter) it facilitates examining the importance and salience of weather information across different contexts and whether there are differences in risk perception and metacognition based on different expeditioner profiles. The information gained would increase understanding of the scope and frequency of weather and climate information use in the Antarctic, its use in operational decision-making, and decision contexts and constraints. This research would provide empirical, evidence-based knowledge to contribute to an Antarctic weather information value chain and education materials; gain insight into discrepancies between user and expert perceptions; inform improved weather services, product development, and risk communication; and clarify where improved services and investments like metacognition interventions may reduce the risks associated with human activities in the Antarctic. There is limited research available on weather risk communication compared to other hazards, thus the research will contribute to the wider risk communications field and may be applicable to other remote communities like those in the Arctic. Broadening risk communication research will aid in improving the understanding and communication of risk information in hazardous environments, about climate change, or during high impact weather events.

**Timeline**

2019-04-09 - 2022-04-08

**Provider relevant aspects**

We aim to share information with National Antarctic Programs in the form of reports and journal articles to inform their policies and practices regarding the use of weather-based information to inform decision-making as it pertains to human health.

**Regional emphasis**

Northern hemisphere: No

Southern hemisphere: Yes
Key project deliverables

Journal articles / PhD thesis
Evidence based best practice information for decision-making in the Antarctic
Weather and climate information mental models

Data management

University of Tasmania. Data storage – stored on the secure UTAS cloud storage system with passwords known only to the research team. Data will be erased five years following publication.

Is data provided to WMO Global Telecommunication System

No

Real-time provision

Not applicable