Climate Service Needs for the Alaska Region National Weather Service

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1. Project Goals. This project seeks to understand the weather, climate, and environmental tools and training needed by NWS Alaska Region climate service providers to improve their ability to meet stakeholder needs.

2. Methods Summary. A web-based questionnaire was sent to 21 Alaska Region National Weather Service staff involved in climate services in May 2018. Surveyed staff included service hydrologists, warning coordinating meteorologists, service coordinating hydrologists, science and operations officers, climate focal points, sea ice analysts, TV meteorologists, a climate science and services manager, a social media coordinator, meteorologist in charge (MIC) and a cooperative program manager. The questionnaire received a 52% response rate (n = 11).

3. Findings

3.1 Factors complicating the analysis and prediction of weather, climate and related environmental phenomena in Alaska.

3.1.1 Data Access (it exists but you can't find it). The frequency that data access impeded the analysis and prediction of weather, climate, and related environmental phenomena in Alaska varied between rarely and frequently (Fig 1). There were some differences across climate service provider type. For example, two MICs and a TV meteorologist believed data access was rarely a challenge, while two service hydrologists perceived data access as a frequent challenge.

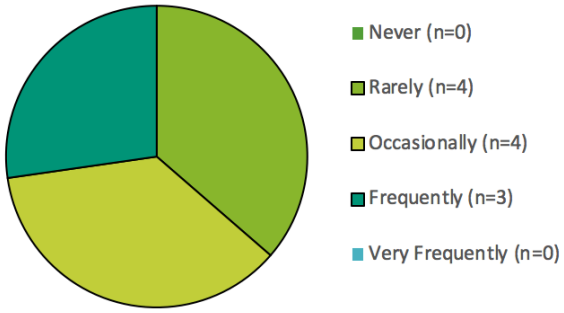

Fig. 1: The frequency that data access complicates the analysis of weather and climate data.

Specific datasets that are difficult to access included:

- Wind profiler data, archived METARS (although can be found on WxUnderground)
- Snowfall and snow depth. When AWOS/ASOS came along, we lost a lot of snow data when the human observers were replaced. Now, with auto-launcher sounds and part time staffing at the remaining WSOs, we are losing even more readily available snow data. I know there are other sources of snow data...*but don't know where to go find it.*
- historical 6hr, 24hr rainfall data at stations for the entire period of record. which stations are being used in certain calculations for specific climate divisions
- River gauges, historical data, short term studies

- Real time observations, including from surface and aircraft reports.

Recommendations for a one-stop shop or repository was the most frequently cited need to improve data access (71% of respondents). Specific needs for the one stop shop included:

- A single portal for all environmental information that was easy and intuitive to use. Such a site should include all the official NCEI information plus all the other "official" information out there that is collected by various research entities and universities. Such a site should be organized according to the various environmental parameters, seamlessly drawing upon all the various sources of the data such that the end user does not even know where the data is coming from until it is presented, either graphically or in tabular form.
- One repository, in one standardized format, with a standardized color table
- It was all on one site with links to each site
- Available in AWIPS, at a single data website,
- There was a one stop shop NWS page that houses data for all subsequent NWS offices to simply link to or embed.

3.1.2 Data Availability

Data availability (the data doesn't exist) was *occasionally* or *frequently* a challenge to the analysis and prediction of weather, climate, and related environmental phenomena in Alaska for 82% of resondents (Fig. 2). Table 1 highlights the specific weather, climate, and environmental-related data and information in Alaska that doesn't exist, but is needed to improve monitoring, analysis, and prediction.

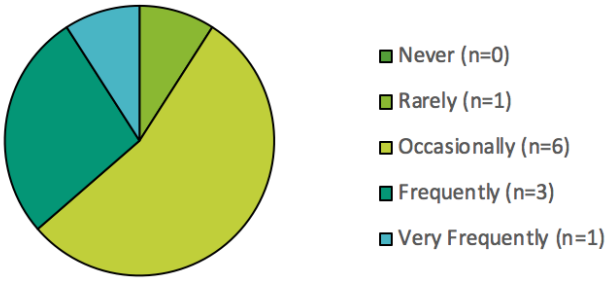

Fig. 2: The frequency that data availability complicates the analysis of weather and climate data

Table 1: Data needed to improve analysis and prediction.

Data needed	**These data are needed to analyze and understand...**
Upper air in Cordova, Glennallen and Talkeetna. More observations across remote areas	weather in the short term
Upper air in the Copper River Basin, Susitna Valley and in Prince William Sound. More surface observations in all areas	weather
Arctic marine buoy data, tide/storm surge data, HF marine radar, real-time snowfall/depth/SWE, high altitude meteorological data on Denali, platforms with ceiling/vis data especially at airports, webcams monitoring river ice	How the longer-term weather forecasts and climate may be modulated by tele-connections
Snow data	Alaska specific impacts based on the various tele-connections; more than just the impact of the ENSO cycle, but all the various others
More sea ice models	how sea ice moves, grows, and decays in the 0 to 10-day timeframe
More radar and surface observations across the state	What is happening in remote locations of Alaska. This could help out NWS forecasters & climate analysts in

	short and long-term prediction, and also pilots as they trek to more remote locations for various purposes
All season high quality precipitation data	QPE and improve QPF
High resolution of QPE data over the state at 1hr increments at 1km resolution from re-analysis data	atmospheric rivers, mudslides, flood forecasting, drought conditions in AK
FDD and TDD brightness and satellite coverages	Snowmelts and river conditions
More ocean-related data, such as regional sea surface temperature anomalies at the weekly time scale	current or forecast conditions and their place in historical context
Snowfall and snow depth	

3.1.3 Data Format

Data format was *occasionally* or *rarely* a challenge to the analysis and prediction of weather, climate, and related environmental phenomena in Alaska for 82% of climate service providers (Fig 3). Both MICs viewed data format as rarely a challenge.

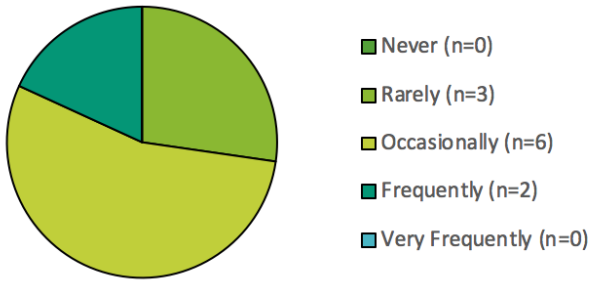

Fig 3: The frequency that data format complicates the analysis of weather and climate data.

3.2 Climate Tools

NWS Alaska region climate service providers use several tools for the analysis of weather, climate, and related environmental conditions (Fig. 4). xmACIS is used the most frequently used tool for the analysis of historical data, with every respondant using this tool at least monthly. LCAT was the least frequently used tool for the analysis of historical data with 78% of the respondents using the tool once a year or less. NCEI is used once every few months by 67% of the respondents for the analysis of historical data.

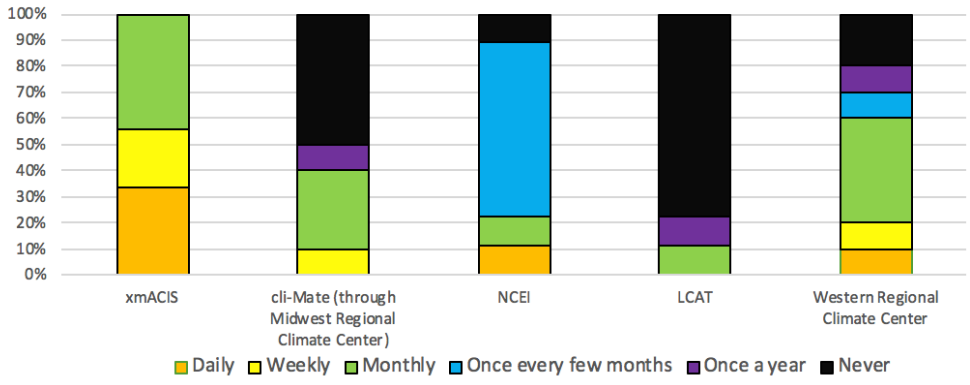

Fig. 4: Frequency that climate tools are used for the analysis of historical data (n=10).

For prediction tools (Fig. 5), CPC spatial outlooks and the North American Multi-model Ensemble were the most frequently used tools. ENSO forecast and CPC 3-month temperature outlooks were used on average monthly. LCAT was never used by 78% of the respondents.

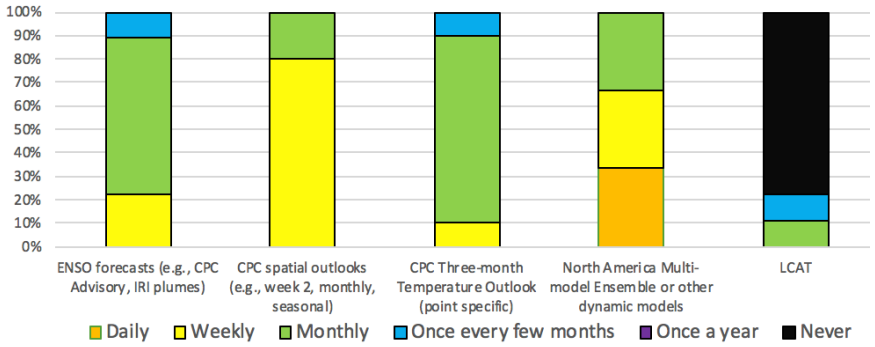

Fig 5: Frequency that climate tools are used for the prediction of weather, climate, and related environmental change (n=10).

Alaska Region NWS climate service providers desired several improvements to existing tools. Improvements to xmACIS was the most frequently identified need. Specific improvements include: (1) Needs to be easier to navigate and use; (2) more simple naming conventions to for example easily request the record highs for a specific location or to get the daily records; (3) it would be nice to be able to query frequency of occurrence for a variable, such as number of days with 0.3 inches of precipitation, and plot that either in tabular fashion or graphically; and (4) needs an option to have daily frequencies for temps, precip, snow, etc. above/below certain values per month/day. Two recommendations for LCAT included better communication of available data (this person was not previously aware of the tool) and the "need for additional flexibility for developing conditional climatologies." Other improvements included "easy to access CPC performance stats", "monthly hyrdo reporting", and "NMME output (or constituents) to be downscaled in near real time in order to start to account for complex terrain influences. Clean-up of the historical climate record needs to continue."

Recommendations for new tools included:

- We could use more tools that focus on the 0 to 10-day timeframe for our sea ice forecasts.
- CIPS Analog for Alaska. Other climatology databases similar to CIPS.
- Definitive QPE analysis
- We need tool to analyzing precip data
- Ability to flexibly extract spatial based information from reanalysis data sets.
- No desired new tools (n=2)

3.3 Stakeholder Engagement

3.3.1 Feedback from stakeholders to service providers on how NWS services can be improved

A few recommendations were provided on how services could be improved, based on stakeholder feedback. These responses included: (1) "Utilities and fuel providers" were interested 3-month forecast heating degree days with a lead time of one month or more, and (2) aviation community (pilots and FAA flight service stations) desired easier access to retrieve satellite imagery at lower bandwidths.

3.3.2 Constraints in addressing stakeholder requests for information

NWS Alaska Region climate service providers face a range of potential challenges in addressing stakeholder requests for information (Fig 6). Inadequate state of the science, lack of time, and the logistics of rotating shifts identified were identified as slightly greater constraints than insufficient internet speed, limited awareness of the best way to communicate with stakeholders and losing track of requests.

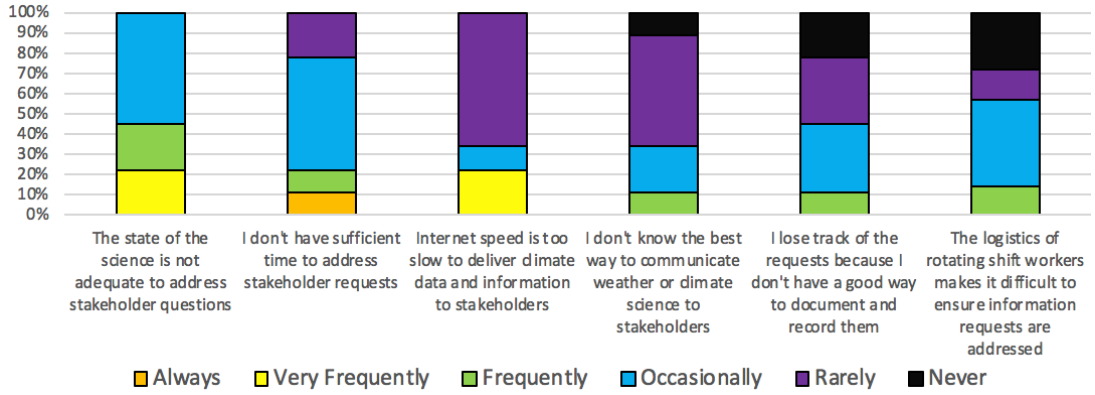

Fig 6: Survey question "How often are the following factors a constraint for you in addressing stakeholder requests for weather, climate, or related environmental information?"

3.3.3 Interest in collaborating with stakeholders to produce more usable science

NWS Alaska Region staff expressed a high level of interest in collaborating with decision makers to produce relevant. All respondents were at least somewhat interested, four were very interested, and three were extremely interested. However, there were some constraints to working with stakeholder to create usable knowledge (Fig. 7). Inadequate time, awareness of user needs, state of the science and inadequate post-processing tools were among the greatest barriers to partnering with stakeholders. Lack of institutional incentives/rewards and lack of personal/professional rewards were considered the least frequent barriers (rarely and never, respectively).

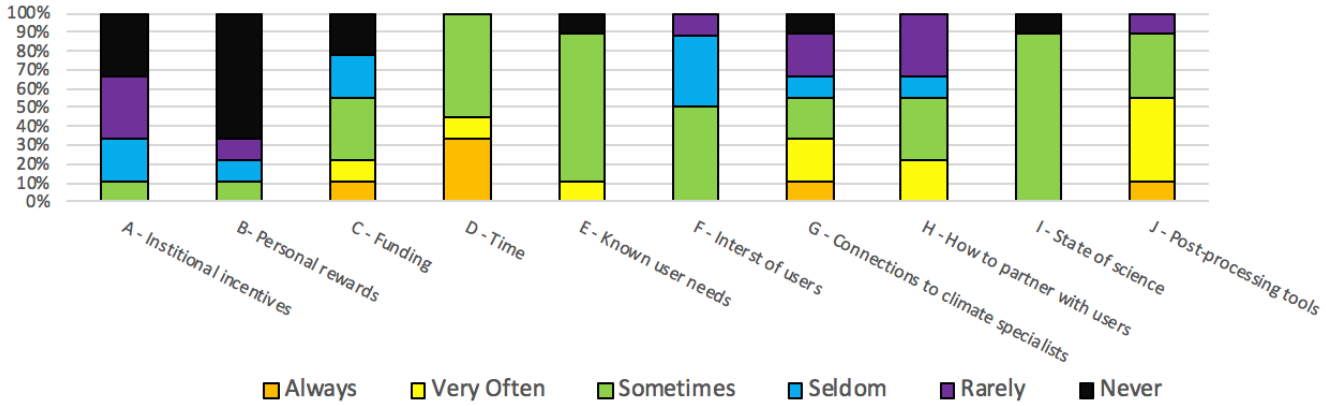

Fig 7: Interest in collaborating with stakeholders (n=11). Survey question "To what extent are the following factors a barrier for you to work with stakeholders in Alaska to develop "impacts-based decision support services" that is more usable?" Legend: (A) Lack of institutional incentives and rewards; (B) Lack of personal or professional rewards; (C) insufficient funding; (D) Insufficient time; (E) Limited understanding of user needs; (F) Lack of interest among stakeholders; (F) Limited partnerships, relationships, or connections with other members of the climate community in Alaska; (G) Limited understanding of how to partner with stakeholders; (H) The state of science in Alaska is not sufficient to address stakeholder data and information needs; (I) The state of the science in Alaska is sufficient to address stakeholder needs, but requires further advances in modeling and post-processing.

4. Acknowledgements

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