



Sea Ice Outlook User Survey Results



INTRODUCTION

The Sea Ice Outlook is an innovative project of the Study of Environmental Arctic Change (SEARCH). The Sea Ice Outlook produces online monthly reports that present, synthesize, and examine different projections of the summer arctic sea ice minimum. More information about the Outlook can be found at:

<http://www.arcus.org/search/seaiceoutlook/index.php>

In 2011, Arctic Research Consortium of the US (ARCUS), as the SEARCH Project Office, conducted an online survey to gather qualitative information on how the Sea Ice Outlook was used as a science and communication tool. The survey was broadly announced via the ArcticInfo mailing list and was open from 11–25 March 2011.

*The Sea Ice Outlook is
“a wonderful exercise
that stimulates both the
public and the
scientists”
–Survey Respondent*

The survey contained 5 questions, 4 of which were structured for open-ended responses; there were 77 respondents. Responses showed that the Outlook is used for a wide range of application: by the scientific community to share results, assess different methods of prediction, and improve seasonal forecasting; by resource managers and industry to inform their activities; by educators and the public to learn about the Arctic; and by others.

SURVEY RESPONSES

The survey responses are included below, by question. Names of the survey respondents are not included.

Survey Question #1: What is Your Role in the Sea Ice Outlook?

77 responses; respondents could select multiple roles:

	Percent	Count
I have contributed Outlook data to a monthly report.	23.4%	18
I use Outlook results in my own work.	33.8%	26
I follow/read the Outlook reports.	85.7%	66
Other (please specify):	15.6%	12

Specified for "Other":

- I am a data provider used for some monthly reports
- I do discuss some of the input the contributions at National Ice Center.
- I would like to contribute to SIO in the future.
- Advisory group member
- Looking to find a fit
- Doing research on arctic marine animal species
- I am a student studying climate change and coastal studies
- Have used the resources and mappings when teaching ice science to middle-schoolers
- Political Persuasion
- Concerned Canadian
- Never used
- On the board

Survey Question #2. In Your View, is the Outlook Valuable as a Science or Communication Tool? If So, How?

76 responses:

- Absolutely, the outlook is a unique forum where scientists can share their ideas on how the system works. I think having to come up with a forecast forces people to distill their ideas and having everyone work on the same problem makes it much easier to compare and peice together people's theories on how the system works and what the important factors are that influence sea ice extent.
- It definitely is, predominantly as a communication tool. As the sea ice retreats more and more in summer, there will be a growing group of people interested in what is happening. They will also want to know what the experts expect to happen in the next melting season. You are early adopters. I think the SIO will be an increasingly sought after product as time goes by.
- As a science tool, to evaluate the methods used and the improvements
- It is very important to have a community view on the sea ice development, especially when talking to the public media. The outlook also raises the awareness of the media and the public. For science it is good to have the application of innovative concepts and the test of the forecast in September.
- I think both science and communication. As a matter of fact, Outlook is communicating science. It raises awareness.

- Yes, useful to see what researchers have worked on.
- Yes, especially important are observations from the various contributors as well as the projections and associated commentary.
- Yes, It is easy to access and understand, but also gives detailed, scientific data if needed
- Yes, it's interesting to compare outlooks
- Yes. I think it provides a unique opportunity for scientists to address an issue simultaneously in public fashion. This is useful for both the scientific community and for others who are interested by the ways in which science is conducted.
- Yes
- Yes, we use it at NPS to watch what might happen to park shores with sea ice retreat and adjacent area communities. Sea ice also impacts marine mammals and subsistence uses of them.
- Modestly so, to illustrate differences in models and projections
- Additional source of information
- I think the outlook is useful as a synthesis of different groups research regarding understanding of Arctic sea ice changes.
- Yes, because it tests our understanding of sea ice in relation to weather and climate
- For now, it is giving the science community information about various alternatives for medium-range forecasting, which will become a high-demand product if seasonal Arctic shipping lanes open.
- Yes - The NIC is an operational center - so most of what we do is look at imagery right now and map what it is doing right now. By having the outlook, it provides a look at the why the ice looks as it does. It provides analysts an idea of the whole picture and what to look for.
- Yes, because it allows one to track the changes and be aware of the magnitude.



Photo by Joed Polly, ARCUS

- Extremely valuable in both roles: helps science of seasonal ice outlook (forecasting) by improving communication scientist to scientist and scientist to public.
- I think it is interesting watching science being made (people have different opinions, and make fairly testable statements based on them -- which can be evaluated within a few months).
- Yes. It provides quick access for people who wants to know sea ice condition in a comprehensive way. One stop- shopping place.
- Unknown
- As a sustained collaboration, the effort offers a way for the public to understand both a complex system and the process of science.
- Yes for keeping up to date on arctic sea ice conditions
- A good overall summary well researched
- Yes. I like to get as much info as possible from as few sites as possible. This is one of the best.
- Yes, it is a source of current, rapidly changing data on ice conditions that is not easily available in any other venue.
- It is very valuable as it is a nice near real-time compilation of activities and data. Very attractive to a wide audience and a very powerful tool of communication among scientists. A forum of excellent experts and world Arctic research leaders.
- While unsure as to the scientific value, it is an excellent outlet for the general public to learn and observe various ice models.
- Communication tool on state-of-the-art of seasonal prediction of sea-ice. I think it is a good way to have a panorama of possible empirical, statistical and model-based techniques of predictions. SIO reports contain also interesting discussions on physical processes involved in sea-ice variability. As such, it is worth of scientific interest.
- Yes. It is useful to have a number of estimates of the forthcoming ice extent collated and presented in a coherent way. This information would not otherwise be readily available.

- Yes it gives a good compilation of how the arctic sea ice is developing each season
- The outlook is very useful. It has increased our understanding of the sea ice-ocean system.



*Photo by Maggie Prevenas
(PolarTREC 2007), Courtesy of ARCUS*

- Science as use it for ice research projects
 - It is valuable as both. I use the outlook for helping the whaling community to plan.
 - Yes. Enhances scientific communication.
- It is very valuable as a science tool as it enables scientists to learn about different seasonal prediction methods and predictive skills. It is also useful as a communication tool as it collects together and summarizes the various contributions.
 - I am convinced that it is valuable for both strands as it develops both the science that needs to get done to create a better understanding on the basis of which forecasts can be made, as well as communicating the transparency of research, the facts themselves, and the application of science
 - Yes, by way of providing a demonstration in public of how scientists can go about testing ideas and verifying them against observations.
 - It's valuable to me, as a non-specialist, because it synthesizes information from numerous sources and presents it in plain english.
 - I don't think as a science tool it is very useful, but as a stimulus for discussion it is good. Because forecasts are not required to have error bounds, wild guesses are as significant in the Outlook analysis as well-founded theories and practical applications. There is no way to tell if a good forecast is just a lucky guess or if it was based on sound evidence. The monthly analysis of the current state of the ice is good and could help predict the ice extent on a short-term basis, but since the ice extent depends so much on unpredictable

winds, there can be little skill a few months out. When the ice was thick, it had some basis for a "memory" so the ice thickness (or age) could be used as a predictor a few months out, but now so much of the ice is thin it is easily blown (or not) to one side of the basin. I don't see that the Outlook has advanced our ability to predict the total ice extent a few months out (beyond the skill of the trend line) and it may have led some to believe we can. I suggest that predictions be required to give a 1-sigma error bound that can be compared to that of the trend line.

- Yes, It allows me to skim over sea ice information from various sources in one place.
- Both, see overall conditions/trends and plan (talk) about what may be future concerns.
- The Outlook is valuable both as a science and as a communication tool. The collaborative environment for comparing projections fosters scientific discussion. The Outlook also generates interest beyond the sea ice research community.
- As a science & communication tool for scientists - definitely but, not so much as a general communication too (it may still be too technical for that).
- Yes. I am hoping I can use the information in GIS and Remote Sensing to help monitor the ecology in northern National Parks.
- Yes, it is a good resource for getting information on sea ice.
- Gives me real numbers to talk about
- Yes. In terms of science it is a good way to encourage ice researchers to collaborate and continue to test their models and understanding of climate change and sea ice. Bringing minds together is always fruitful. As a communication tool, the outlook is easy to understand and interesting. It also helps us all understand the challenges of forecasting future climate change impacts. The Outlook creates a venue for scientists to stand by their work in the public eye (vs in the literature or at a conference).
- To find out what is considered relevant for research in earth surface processes in arctic regions
- The Sea Ice Outlook is valuable both as a science and a communication tool in that it contributes to an understanding of reductions in fall sea ice extent

from a variety of perspectives, and offers the opportunity for integration of such perspectives. The Sea Ice Outlook also provides the opportunity to provide a set of metrics that can be used to monitor seasonal changes in sea ice extent, thickness, and volume, for the purposes of prediction. In light of recent work...the sea ice outlook may be expanded to include an assessment of trends in seasonal changes in sea ice parameters.

- Yes it provides current information a wide group of users and stakeholders.
- Yes, it is building a database that is increasingly useful as a reference source as well as assessing trends in sea ice conditions, especially in the Bering Sea which is often overlooked in sea ice monitoring.
- Updated refresher of concepts, planning and opportunity.
- Yes, it provides a guide for both predicting the extent of sea ice and the uncertainty
- The Outlook provides a new kind o science forum, where different investigators contribute their best estimates and rationale. The public sees more of the process, both uncertainty and emerging consensus, behind the science. From a public media standpoint, this may be SEARCH's most visible contribution.
- My research is mainly on the history of Arctic whaling from Britain, but also on current changes in Antarctic sea ice. The Outlook is valuable for both.
- I find the outlook very useful in that it causes me and my colleagues to follow and try to understand the processes shaping the Arctic sea ice minimum more closely.
- Yes. It allows us to monitor the status of sea ice and how the loss of sea ice will affect fish and wildlife populations as well as change the face of the Arctic.
- I think this is a wonderful exercise that stimulates both the public and the scientists studying climate change.
- The Outlook is valuable as it allows access to data and resources.



Photo by USFSW/Brad Benter

- Yes, as a lay observer, albeit with a science background, these outlooks illustrate current scientific opinion on status of arctic ice, and provide an illustration of the margin of error in models/predictions.
- I think the Outlook is important both as a scientific endeavor and as a communication tool. Sea ice forecasting is not easy given year-to-year variations in unpredictable weather. Indications are that year-to-year variability in sea ice extent will increase as the ice pack thins. Understanding and communicating the limits of what Arctic scientists can predict is important for building credibility with the general public and fellow scientists.
- It is. I can quickly read updates without having to go get and plot the data myself. The graphics are widely used by the research community. Many plots were shown by various presenters at the Gordon Research Conference Polar Marine Science for example
- Yes because it clearly illustrates changes that are occurring in the Arctic for those not affiliated with polar science
- Absolutely, I found it provides the most valuable insights and is a profound corrective to usual media responses regarding the state of the Arctic.
- As a science tool: it helps teams to test & validate their models As a communication tool: it's a central place to find outlooks and to get informed about what's happening in the Arctic
- Valuable as a science tool to see what trains of thought other people follow
- Yes, it shows clearly the different possible methodologies that researchers can use to predict Sea Ice.
- Yes. Sea ice is a tangible and useful variable for explaining climate change and its implications to broader audiences.
- Communication tool for non-scientists.
- Yes. Monthly Reports on Ice Extent
- To me and most of my peers it is most useful as a communication tool for alerting - convincing - persuading others we should be more aware and active in regards to effects the loss of Sea Ice will have on society.

- Yes. I like the data on what Arctic Scientists think will happen this year. This provides more insight into what the scientists think about the long run issues in the Arctic.
- Public testing and refining of models and the key variables

Survey Question #3. In What Ways Have You Used the Outlook? Please List Any Specific Examples, If Applicable

75 responses:

- To see range of suggested values for sea ice minimum.
- I discuss every Sea Ice Outlook as soon as it comes out on my blog and discuss it with commentators.
- Example of the use of our data (CERSAT/Ifremer datasets) Can be used also as a teaching or outreach tool
- To provide a statistical estimate of the September extent is a suitable topic for a bachelor thesis. Therefore, I used this topic for teaching.



Photo by Mary Anne Pella-Donnelly (PolarTREC 2007), Courtesy of ARCUS

- I have used Outlook for education. I have also referred to the data presented.
- Improved understanding of (overall) Arctic FY and MYI behavior and trends Focus on study of Chukchi and Beaufort seas
- As an outreach tool
- Yes, I can reference it for climate change related work, especially for production of EISs in the Arctic
- Simple examination in the context of sea ice variability research we do
- As a teaching and outreach too and in publications referring to collaborative scientific efforts.
- I only use it for personal knowledge

- Used as a communications tool for climate change scenarios and park planning.
- To test model results
- I have shown the outlook predictions in presentations and mentioned them in publications.
- My estimates are based on observations and simple judgement. It isn't a complex method and I'm always curious to see how it compares to the sophisticated models.
- Use my own results and "official" results to refine my technique.
- I used it as an outreach tool last year at the Polar Science Weekend. The public made forecasts of the September ice extent at the end of February. The average of all their forecasts was better than about half of the scientifically based forecasts (since it landed in about the middle of the "science" based forecasts). Most important, it was a good avenue to some interesting discussions. One guy even came back this year to see how he did in his forecast.
- I use the outlook as training with our analysts. I always forward it to them and we like to use it as a discussion topic in our training program. It helps broaden their thought process by looking at these research scientist and seeing their ideas.
- Never used
- Have used it only for my own knowledge.
- I use it to keep up with sea ice prediction science at the level (not in depth but not novice) and speed (check in a couple times a year, there is not too much to read) that benefits me. I use it occasionally for outreach to (e. g. when invited to meet with) Navy, NOAA, and other agencies or operational groups when asked about the status of ice forecasting.
- I have read it to get a general sense of what modeling tools are being used in climate research.
- Mostly to help me understand what's going on, an "ensemble forecast" for sea ice

- I used the results in my own research. The wide range of heuristic forecasts highlight different factors in the climate system that might influence sea ice. In developing statistical models the outlook has been useful in determining what predictors to include and test.

- Repeatedly written about SIO on Dot Earth blog.

- Circulating sea ice reports

- Personal interest only

- Research and outreach for Thin Ice; the Bering Sea in the Age of Climate Change. IPY ed/outreach, vodcasts on NOVA Extreme Ice web site or NCSE Changing Oceans web site. Finished project will include book, Teacher Domain (WGBY), film.



Photo by Bill Schmoker (PolarTREC 2010),
Courtesy of ARCUS

- I referred to discussions in my own scientific publications, I have made journalists aware of the Outlook, and I have used the Outlook to validate my own opinion about the state and fate of the Arctic sea ice cover.

- Pretty much just used it to educate myself

- SIO reports gave me the basis for my research work on seasonal predictability of sea-ice (when I was a very young scientist!). I am used to refer to SIO while presenting the different techniques available to get a seasonal outlook of the SEP sea-ice cover, in general or conference talks, or in papers.

- As an aid to providing advice on the likely minimum ice extent.

- Sorry. I'm not a scientist (professional, amateur or teacher) or a journalist.

- The outlook gives me an overview of whats happening outside of my general work area which is Svalbard / Barents sea

- I used results in my own research.

- Used results in your own research

- As a Meteorological Technician in Barrow, Alaska, I use the outlook in helping the community plan for hunting and fishing and it adds a level of safety.

- Outlook encouraged us to produce a sea ice prediction for Sept 2010. 2. For comparing our Outlook prediction with others.
- Keeping up to speed with the state of the art and caveats - communicating from the Outlook: trends, facts, state of insight - as a credible resource
- Per #3. Also in my private blogging. The SIO submissions have also prompted the design of a few experiments here.
- As an arctic biologist, I use it for my own continuing education and I have used some of the products in my outreach efforts.
- I am a meteorologist who works with wildfire management agencies in Alaska. The sea ice has an effect on the weather in Alaska and particularly on the north slope where it appears that fire activity may be on the increase.
- Coastal erosion planning. Ice /weather for hunting and Search and Rescue.
- I've used in to compare the range of projections from different techniques. I have also directed students towards it.
- Followed along to observe the predictions and explanations.
- Not so far
- Assess general ice conditions for areas off of Alaska
- Teaching tool, general conversation re global climate change
- I use Outlook to inform myself about sea ice and modelling in the high arctic. I do wildlife research further south in the seasonal/annual sea ice zone.
- I only receive occasional notices through ArcticInfo elist about reports published through Outlook
- The Sea Ice Outlook has been used to assess dynamic contributions to changes in sea ice extent...and has been used as an outreach tool for undergraduates.
- To inform my thinking and writing.
- Primarily as a reference or as an aid in seeking relevant references for research I have been doing on some bering sea islands. Also climate change

talks re Arctic Visiting Speaker program and OLLI class on climate change and arctic ecology.



Photo by Lollie Garay (PolarTREC 2007/2008),
Courtesy of ARCUS

- Teaching and outreach for marine biology course.
 - Made decisions on when and where I would focus Arctic Ocean Sampling
 - I read other predictions, and their rationales, then was inspired to contribute my own, and to follow the ice extent data more closely. I pointed this out to my students as an example of science as a process of testing and discovery.
-
- Own and joint research
 - To stir interest Increased awareness Provided lots of useful information for explaining these issues to journalists
 - I used data collected from this site in a research paper for my course.
 - Knowing and predicting ice conditions in critical for deploying drifting buoys.
 - I have used the links to show the daily ice extent mappings. Additionally there are numerous links to various resources from this page.
 - My use of the Outlook is confined to personal education, and as a predictive tool in determining possible regulatory responses to global warming.
 - I have used the Outlook as a basis for comparing scientifically motivated predictions with educated guesses from intelligent people.
 - In my own research, in proposals and talks; the latter both science and outreach (all ages) talks. Also to regularly check what IS happening, as indicated above.
 - Outreach

- The outlook is a respected source of information for local climate change activists and reliable enough to serve as 'the scientific opinion' while writing articles.
- I published & commented the efforts and results on French climate forums (I also defended the Outlook against deniers mocking it)
- Listed it on cv
- I've used it to differentiate between the most effective predictive techniques, and especially which are least effective.
- I follow the outlook regularly and occasionally cite it in my own writing
- Outreach tool
- Informative Insight
- Outreach Tool. Mainly in personal contacts, letter writing to politically elected representatives.
- I have discusses the outlook summaries as examples in my High School Chemistry classes. Students do not know that scientists have this type of discussion. It provides a basis for the students to improve their understanding of ice science.
- Personal interest

Survey Question #4. Please List Any Publications You Are Aware of That Either Reference the Outlook or Are Related to the Outlook in Some Way

4 responses, with references to the following publications:

- EOS articles
- Murray et al., 2010 International Study of Arctic Change Science Plan. ISAC Program Office, Stockholm.
- Stroeve, J.C., M.C. Serreze, J.E. Kay, M.M. Holland, W.N. Meier and A.P. Barrett (2011), The Arctic's rapidly shrinking sea ice cover: A research synthesis. Climatic Change, in second review.
- I don't know that we directly quote from the outlook, but I know the info we read makes its way into our understanding of the ice extent, and hence our discussions on the sea ice with our clients - in this case the US Navy and Coast Guard.

- <http://nsidc.org/arcticseaicenews/index.html>
- <http://neven1.typepad.com/blog/>
- Nytimes.com.dotearth (enter "sea ice outlook" in search box.)
- Haas, C., Hendricks, S., Eicken, H., Herber, A.(2010).Synoptic airborne thickness surveys reveal state of Arctic sea ice cover, Geophysical Research Letters, 37, L09501, 5 p., doi:10.1029/2010GL042652 .
- Holland et al. 2010, Inherent sea ice predictability in the rapidly changing Arctic environment of the CCSM3. Climate Dynamics.
- Blanchard-Wrigglesworth et al., 2010, Persistence and inherent predictability of Arctic sea ice in a GCM, Journal of Climate.
- Doescher et al., 2009, Quantifying Arctic contributions to climate predictability in a regional coupled ocean-ice-atmosphere model. Climate Dynamics.
- Kauker et al., 2009, Adjoint analysis of the 2007 all-time Arctic sea ice minimum. GRL.
- Numerous publications and products available from NSIDC
- Sea Ice for Walrus Outlook (SIWO)
- <https://www2.ucar.edu/atmosnews/opinion/3358/sea-ice-and-hurricanes-two-big-wins-seasonal-prediction>
- Klein¹, DR & Sows, A. in press. HISTORY OF POLAR BEARS AS SUMMER RESIDENTS ON THE ST. MATTHEW ISLANDS, BERING SEA. Arctic. ; Klein, DR & Shulski, M. in press. The role of lichens, reindeer, and climate in ecosystem change on a Bering Sea island. Arctic.
- Many blogs referred to it; this is a whole new media dimension, and one that ultimately leads rather than follows the more traditional news media.
- I'll promise to reference the SIO more often within future articles.
- Publication in preparation on coastal sea ice break-up
- I've seen it referenced on realclimate.org and in several other places
- NOAA related articles

5. Is There Anything Else You'd Like Us To Know About Ways In Which You Have Used the Sea Ice Outlook?

38 responses:

- This is a valuable resource for capturing important, hard to get information about a remote part of the planet, in realtime, to contribute to public understanding. Nothing else like it.

*[There is] nothing else like it.
-Survey Respondent*

- Congratulations - a great concept and well executed

- Nope. Keep up the good work.
- I have used the Outlooks over the past couple of years to better understand where uncertainties lie (within the various approaches).
- I hope you will continue the good work.
- When the setting is right, I point to it and suggest that NOAA can use it as a model for one way to transition research to applications.
- I usually use the summary chart at the end of the season to promote the results to outside the scientific community.
- I particularly like the chart showing a range of forecasts from different sources
- An important source of information, opinion, and discussion.
- How well are the monthly reports synthesizing the different views held? We would get a better idea of the strength of believe in different techniques with a betting market. That might be illegal for some participants but it may be possible to run a play money market like ideosphere:
<http://www.ideosphere.com/> To encourage contributors to participate, it may be necessary to have a small prize for whoever wins most play cash on the betting market. Just an idea for further synthesis of the information made available.
- Forecasting the Arctic Winter sea-ice cover is also a scientific/technical issue!
- Conference Abstracts/Talks http://www.arctic-frontiers.com/index.php?option=com_docman&task=doc_download&gid=476&Itemid=306&lang=en
- Don't forget that doing it also shapes the actors and their community - there is added value in this
- My own personal interest and curiosity on the subject and also on how this type of information is made available to different user groups. Thank You.
- I do like to tease [contributors] when their forecasts are off :)))
- Its good to have the Outlook available.
- Never used

- List of references using Sea Ice Outlook
- Sea Ice Outlook has been helpful in synthesizing a variety of perspectives, and in promoting collaboration amongst a variety of disciplines.
- I find it fascinating so maybe it provides a means to keep thinking about what is going on in the Arctic.
- Public accessibility and real-time publication are keys to the Outlook's success. Underlying both are a surprisingly small number of public, real-time datasets -- principally, NSIDC's ice extent, and parallel to that the IJIS daily data. I wish more polar scientists would make the effort to publish frequently updated time series of this sort. They reach a broader audience that scientists need to reach now, because we are losing the communication wars to politically-oriented bloggers who spin the science.
- No, but thank you, and keep it going.
- I am glad someone is keeping track of this so the data can be used to educate governments and individuals on what is happening.
- I'd like to use this point to encourage the contributing members to provide more information about their current hypotheses concerning future developments in the Arctic. Although a strictly scientific view is indispensable, it should not be left to the media to express their speculations while 'analysing' data. Shouldn't an outlook include multiple years? Also I'd would appreciate, if the high-level outlook includes more information from field work. Some aspects get lost in condensed data (e.g. sea ice concentration 2010, rotten ice). Anyway the SIO is the foundation of any discussion about sea ice, whether it happens in public, in the media or not. Personally I believe the Arctic is the only well known feature we have on the planet capable to visualize consequences of Climate Change and raise awareness. The Arctic is an icon, please do not stop observing and aggregating multiple approaches. This diversity is the key to understand and to measure the established knowledge about Arctic Sea Ice.
- In 2010 data came out much too late. There are more and more data-holics, people looking for real-time data on these topics: Please, release the outlooks no later than the 10th of each month, otherwise it looks like "Hey they've been waiting until September 30 to issue the outlook from July!"...
- Used the outlook for walrus as a reference for current ice conditions

- It's not always clear when predictions were submitted, due to the delay in publishing.
- Information about sea-ice conditions & weather forecasts very helpful/useful tools
- Informative tool to educate the general public on climate change



Photo by Patty Janes (TREC 2006), Courtesy of ARCUS