# Alaska Climate Dispatch

*A state-wide seasonal summary & outlook*

Brought to you by the Alaska Center for Climate Assessment and Policy in partnership with the Alaska Climate Research Center, SEARCH Sea Ice Outlook, National Centers for Environmental Prediction, and the National Weather Service.

**Summer 2010**

## IN THIS ISSUE:



## Spring Weather Summary

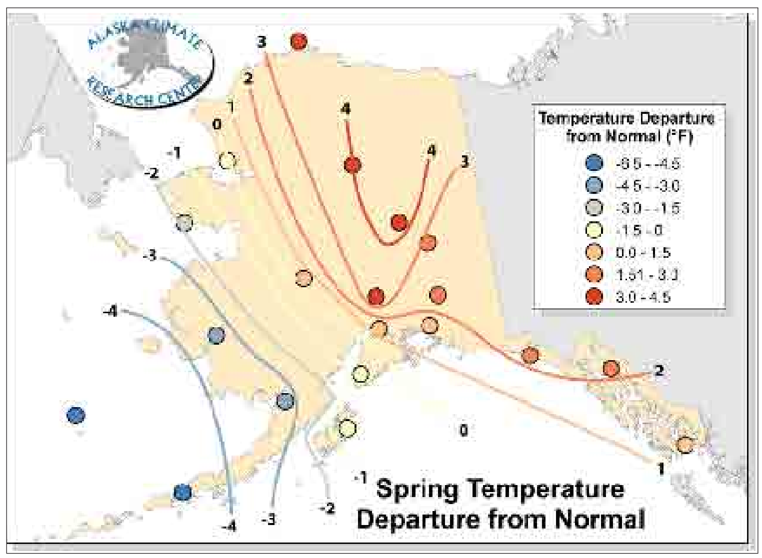
Parts of Alaska were unusually warm and dry during the 2010 spring (March, April, May), while other parts of the state were colder and wetter than usual. The figure in the next column shows the spring temperature departure from the recent 30-year average at the main National Weather Service stations in Alaska. Most of Alaska had temperatures above the long term average, especially the eastern, northern and central part of the State. The largest temperature departures above the 30 year average were at Fairbanks (4.2°F), Bettles (4.0°F) and Barrow (3.9°F). Above-normal temperatures were also observed in the Southeast; however, these temperatures were closer to the long-term average than those in Interior and Arctic Alaska. Temperatures in SouthwesternAlaska and the Aleutians were much colder than normal for spring time. The colder temperatures in Southwestern Alaska were consistent with the extensive ice cover in the Bering Sea (see section on sea ice). Temperatures were 6.3°F colder than the 30-year average at St. Paul Island, 4.5°F colder than average at Cold Bay and 3.4°F colder than average at Bethel.

### Temperature

On a monthly basis, the temperature departures during March varied widely across the state. As shown in the table on page two, Arctic and Southern Alaska recorded temperatures somewhat warmer than normal, while the Interior and especially Western Alaska were much colder than normal. St. Paul Island in the Bering Sea was 13.4°F colder than normal in March, an extreme departure that was larger than at any other Alaskan station in any of the spring months during 2010. April's temperatures were warmer than normal, with the exception of the Southwest. In April, Barrow was 8.4°F warmer than average, the largest positive departure from average in any 2010 spring month. May's temperatures were above normal across much of Alaska, although Arctic, South Central and South-Eastern Alaska reported values below normal. In Interior Alaska the weather was unusually warm. Fairbanks was 5.2°F warmer than the average in May, and temperatures reached 80°F or higher on four days. The warmest day was May 27 when the temperature reached 82°F. Temperatures this high are not normally expected until June.

### Precipitation

Precipitation over Alaska varies tremendously from south to north. On the average, Yakutat receives about 30 times more precipitation than Barrow. Also, departures from normal monthly and seasonal precipitation vary widely from station to station, so we could not make a map with contour lines of precipitation or its departures from normal. Instead, we summarize the data in the figure on page two by color-coding each station's spring




*http://climate.gi.alaska.edu/index.html*

precipitation as a percentage of the station's normal. In Barrow, where the annual precipitation is light, more than 3 times the normal precipitation was reported for spring 2010. Otherwise, precipitation was generally lighter than average, especially in Interior Alaska, with large variations from station to station.

March was very dry in Interior Alaska. Fairbanks reported its seventh consecutive month with below normal precipitation. Snow cover in March was less than 50% of the expected amount, the 3rd lowest amount since observations started in 1930. Fairbanks also received only 0.09" precipitation, just less than a third of the expected amount. In contrast to the Interior, Southeast Alaska reported above

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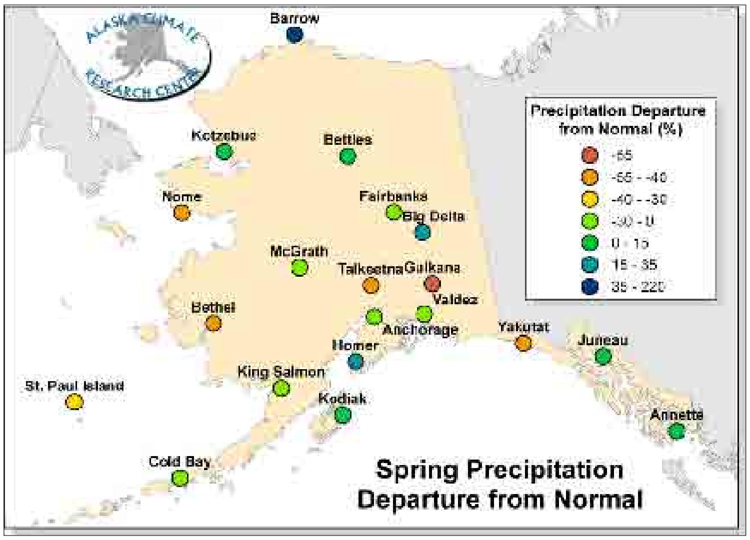
normal precipitation in March. Precipitation during April was above normal state-wide, especially at Barrow where it was the 4th snowiest April on record. May precipitation was below average for most of Alaska. Fairbanks reported 40% less precipitation than normal during May. Parts of Southwest and Southcentral Alaska, and notably the Arctic, reported above-normal values. It was the wettest May ever observed at Barrow (0.52"), with more than 4 times the normal amount of 0.12". This record can be attributed




***http://climate.gi.alaska.edu/index.html***

largely to a new record for daily precipitation on May 28, 2010 (0.30").

Finally, in the table below, the departure from the long-term normal temperature in °F, and the long-term normal precipitation in percent are shown for each of the spring months and for the combined spring totals. Note that, because each station's average precipitation varies from March to May, each month is not weighted equally in computing the departure from a station's normal precipitation for the entire spring.

| Station | Temperature Deviation (°F) | | | | Precipitation Deviation (%) | | | |
|---|---|---|---|---|---|---|---|---|
| | March | April | May | Seasonal | March | April | May | Seasonal |
| Anchorage | 1.6 | 0.6 | 2.1 | 1.4 | -5 | 133 | -71 | 9 |
| Annette | 1.3 | 1 | 2.1 | 1.5 | 76 | -36 | -55 | 1 |
| Barrow | 3.8 | 8.4 | -0.6 | 3.9 | 67 | 208 | 342 | 218 |
| Bethel | -11 | -1.4 | 2.2 | -3.4 | -66 | -26 | -41 | -44 |
| Bettles | -0.5 | 6.8 | 5.7 | 4.0 | 16 | 66 | -14 | 12 |
| Big Delta | 1.8 | 3.5 | 3.5 | 2.9 | -100 | 295 | 4 | 34 |
| Cold Bay | -9.3 | -3.2 | -1.1 | -4.5 | -8 | 50 | -50 | -5 |
| Fairbanks | -0.3 | 7.7 | 5.2 | 4.2 | -68 | 38 | -60 | -43 |
| Gulkana | 3.5 | 1.7 | 3 | 2.7 | -28 | -23 | -83 | -55 |
| Homer | -1.9 | -0.5 | -0.6 | -1.0 | 43 | 78 | -71 | 24 |
| Juneau | 2.8 | 1.1 | 2.9 | 2.3 | 75 | 4 | -64 | 5 |
| King Salmon | -8 | -2.2 | 0 | -3.4 | -48 | 16 | -50 | -29 |
| Kodiak | -1.5 | -1 | 0.2 | -0.8 | -10 | 10 | 12 | 5 |
| Kotzebue | -3.7 | 4 | -0.6 | -0.1 | 0 | 68 | -82 | 1 |
| McGrath | -5.6 | 3.6 | 4.4 | 0.8 | -75 | 120 | -49 | -13 |
| Nome | -8.2 | 0.4 | 1.8 | -2.0 | -73 | 11 | -64 | -42 |
| St. Paul Island | -13.9 | -3 | -2.1 | -6.3 | -64 | 14 | -52 | -34 |
| Talkeetna | 3.7 | 2.3 | 3.7 | 3.2 | -79 | 15 | -57 | -42 |
| Valdez | 2.4 | 0.6 | 2.2 | 1.7 | -3 | 21 | -52 | -9 |
| Yakutat | 2.6 | 1.9 | 2.6 | 2.4 | -6 | -56 | -67 | -42 |

***Departures from normal temperature (°F) and precipitation (%) for each of the three spring months and the entire spring season.***

# Summer Weather Outlook

The Climate Prediction Center of the National Weather Service issues 30-day and 90-day outlooks on a regular basis for the United States, including Alaska. The outlooks consist of maps of probabilities that the upcoming season or month will be in the warmest or coldest terciles in relation to the baseline period of 1971-2000. The warmest and coldest terciles are the 10 warmest and 10 coldest temperatures of the corresponding season (summer, in this case) during the 30 years in the baseline period. The same type of probability map is issued for precipitation. It is important to note that these outlooks refer to the averages of temperature and precipitation over an entire season (e.g., summer); individual days, weeks and even a month can differ from normal in the opposite sense without invalidating the forecast, as long as the three-month averages are in the indicated tercile.

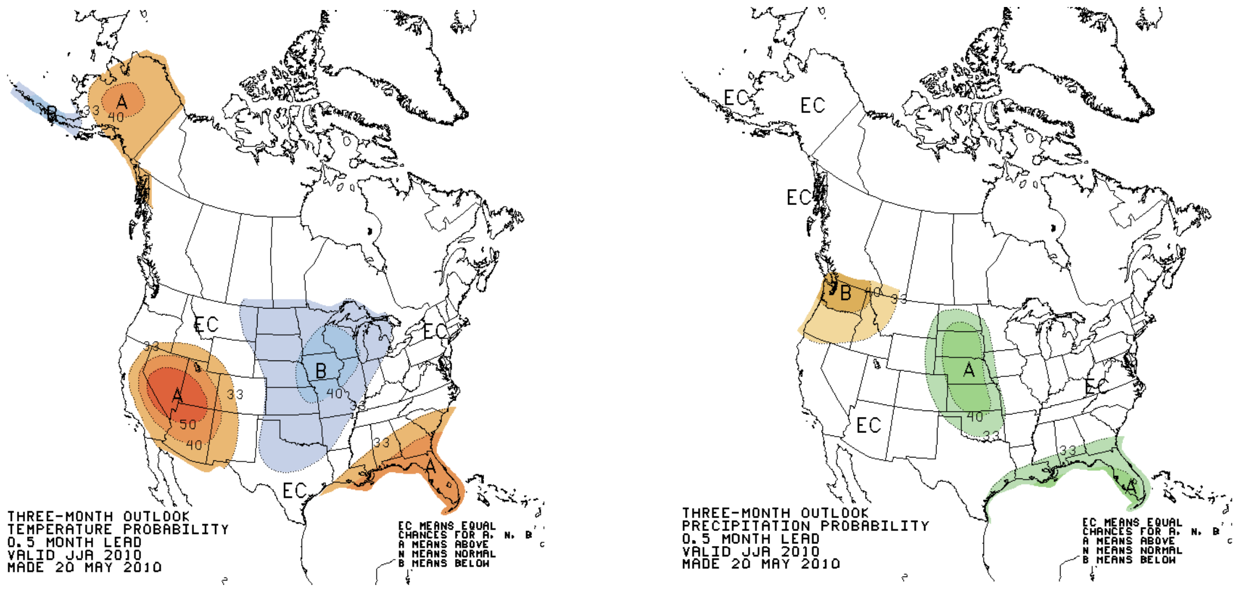
## Temperature

The left panel in the map on the following page shows that there is a greater-than-random chance that temperatures for the upcoming summer (June-July-August) will be warmer than normal over nearly all of Alaska. Specifically, for the western Interior, there is a greater-than-40% chance that the average summer temperature for 2010 will be in the warmest third of all summers of the baseline period. Note that a 40% likelihood is not much greater than the random-chance probability of 33.3%, so the value added by the forecast is modest relative to a forecast that is based on a random selection of past occurrences. The southwestern United States and the southeastern states are also predicted to be warmer than normal. The Aleutians have a better-than-random chance of experiencing a summer in the coldest tercile, as does much of the Great Plains and Midwest in the lower 48. The cooler-than-normal forecast for the Aleutians, together with the warmer-than-normal forecast for the Interior and northern Alaska, represents a continuation of the springtime pattern described earlier in this newsletter.

## Precipitation

The right panel in the map indicates that there are equal chances that the summer precipitation in Alaska will be in the highest, middle and lowest terciles, so the tools do not provide a strong indication for either a wetter- or a drier-than-normal summer. In the lower 48, the Pacific Northwest has a greater-than-random chance of a summer in the driest tercile, while the northern Great Plains and the Gulf Coast have a better-than-random chance of a summer in the wettest tercile.

To produce forecasts, the Climate Prediction Center uses a number of tools, including (1) the present and forecast status of El Nino/La Nina, a tropical Pacific Ocean warming or cooling, and its known associations with monthly and seasonal climate anomalies in the middle and high latitudes; (2) recent (10-30 year) trends for a particular location and time of year (not used for Alaskan precipitation); (3) the present and anticipated states of atmosphere/ocean oscillations such as the Pacific Decadal Oscillation, the North Atlantic (Arctic) and Pacific-North American pattern, and a 30-60 day pattern in the tropics known as the Madden-Julian




***Summer forecasts for temperature (left) and precipitation (right).*** ***http://www.cpc.ncep.noaa.gov/products/predictions***

Oscillation; (4) persistently dry or wet soils in the summer (not used for Alaska), and snow and ice cover anomalies in the winter; (5) statistical forecast tools such as canonical correlation analysis, multiple linear regression onto predictors obtained by a screening procedure, and analogs; (6) a dynamical forecast model, known as the Coupled Forecast System (CFS), which runs like a weather prediction model but with interacting ocean and sea ice; and (7) an objective consolidation of the tools listed above.

For the summer 2010 forecast, the Climate Prediction Center noted that the past winter's El Niño has essentially vanished, and there are indications that a La Niña (cooler-than-normal tropical Pacific Ocean waters) may begin to influence weather patterns during the summer. Specifically, the probabilities are approximately 50% for La Niña conditions, 50% for neutral conditions, and negligible chances of El Niño conditions during the summer of 2010. The forecast of warmer-than-normal summer temperatures over Alaska was influenced by recent trends of summer temperatures. The Climate Prediction Center has also modified its outlooks for subsequent seasons (autumn, winter) due to the indications of the development of a La Niña. The outlooks now show a greater-than-average chance that the winter of 2010-2011 will be in the coldest tercile over nearly all of Alaska south of the Brooks Range. The seasonal and monthly (30-day) outlooks issued by the Climate Prediction Center are available at http://www.cpc.ncep.noaa.gov/ The outlooks at this site are updated on the third week of each month, while additional updates of the monthly outlooks are provided on the first day of each month.

More information about the standard forecast tools, their skill and the forecast format can be found at: http://www.cpc.ncep.noaa.gov/products/predictions/long_range/tools.html
More information on how the Climate Prediction Center produces these forecasts can be found at: http://www.cpc.ncep.noaa.gov/products/predictions/90day/fxus05.html

## Summer Wildfire Forecast

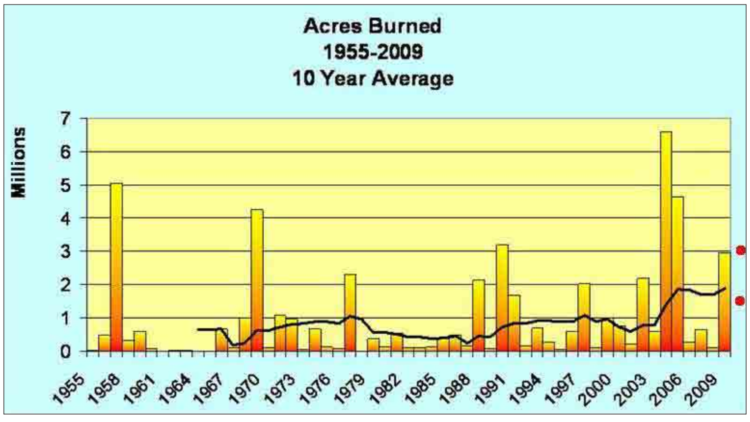
Wildfire season severity in Alaska varies tremendously from year to year, in response to weather conditions during and before the summer fire season. The figure on page four shows this variability. Although methods of data collection have improved over time, the number of acres burned has ranged from close to zero to more than 7 million acres (in 2004). Key weather factors for total area burned are the dryness of the summer and preceding spring, and the number of ignitions by lightning strikes, which account for most of the large fires in Alaska. Dryness of fire fuels is influenced by both precipitation and temperature, which together affect the relative humidity and the amount of evapotranspiration. Evapotransporation is the combined sum of evaporation and plant transpiration from land areas to the atmosphere.

The 2010 summer began unusually dry over much of Interior Alaska, because of the warm, dry spring, and the relatively low snowpack at the end of winter over all but far southern Alaska. The thin snowpack meant that there was little water released by the spring snowmelt. The absence of a deep snowpack led to an early loss of snow cover, a weak discharge pulse from snowmelt, and a mild breakup over much of Interior Alaska. Not surprisingly, the fire season began early. Approximately 260 fires burned about 260,000 acres by the end of May (http://fire.ak.blm.gov/content/aicc/sitreport/current.pdf); 87 of these fires were actively monitored or fought.

While prediction of fire season severity has obvious benefits for fire management and other planning, seasonal predictions are in their developmental stage and the products are strictly experimental. We summarize fire season outlooks from two sources, including their forecasts of the 2010 burn areas in Alaska.

## The First Experimental Forecast

The first experimental forecast, prepared by Paul Duffy (Neptune, Inc.) in collaboration with the Alaska Center for Climate Assessment and Policy, is also based on atmospheric circulation patterns that influence seasonal temperature and precipitation across large regions of Alaska (http://www.uaf.edu/accap/research/season_fire_prediction.htm). This experimental product uses the historical data on area burned, historical teleconnection indices, and monthly temperature and precipitation for Interior Alaska. Specifically, the predictors include indices of the Arctic Oscillation, the East Pacific/North Pacific teleconnection, the Polar teleconnection, and the West Pacific teleconnection as well as average temperature and total precipitation from the months before the period covered by the forecast. The teleconnection data are available from NOAA's Climate Prediction Center, while the prior temperature and precipitation data over Interior Alaska are also obtained from NOAA. These predictors are fed into statistical models that forecast the total area burned for the upcoming season based on the early-season atmospheric circulation patterns. Predictions are made monthly from March through June. The forecasts made with the data available through May indicated a 5% chance that less than 500,000 acres will burn, a 40% chance of a moderate fire season with between 500,000 and 1,500,000 acres burned, and a 55% chance that more than 1,500,000 acres will burn. The median forecast from this model is a total burn area of 1,570,000 acres, which is indicated by the lower red dot on the following figure. This forecast for the 2010 burn area falls into the highest (most severe) tercile of the historical record.
Later updates to this forecast will be posted at:
http://zeus.neptuneinc.org/xRISA/index.html.



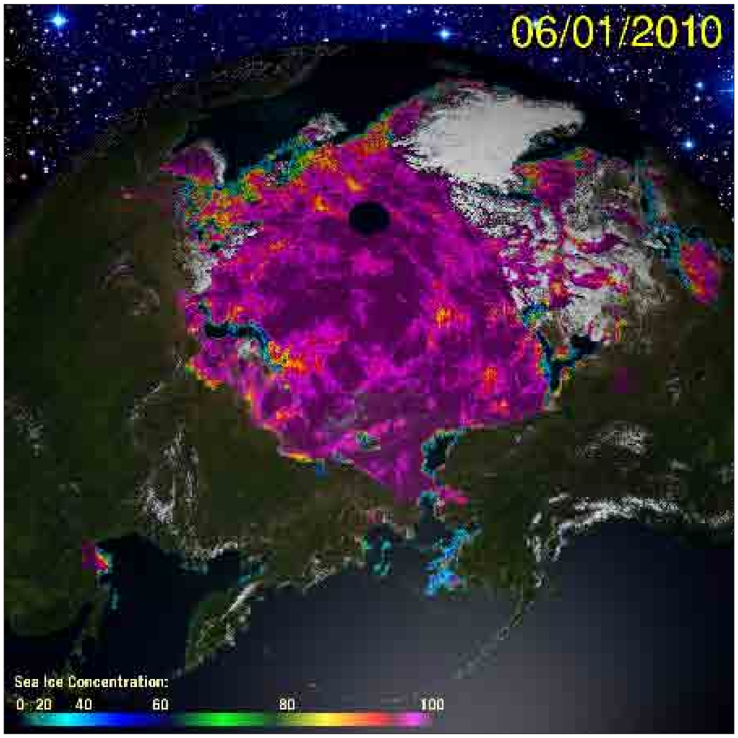

*Acres burned by wildfire in Alaska, 1955-2009*

## The Second Experimental Forecast

The second experimental outlook is based on a statistical model developed by Peter Bieniek of the University of Alaska's Atmospheric Sciences Department. For its predictors, this model uses point values of upper-air geopotential height (500 hPa) and surface air temperature from the winter and spring months (prior to May). A correlation analysis produces maps showing the locations of the strongest predictors, which are then used in a multiple regression formula. The predictors selected for inclusion seem to be related to circulation patterns associated with the El Nino/Southern Oscillation and the associated Pacific/North American teleconnection pattern in January and March, together with a point near the center of a North Asia Pattern of circulation in February. While these predictor points are displaced by location and time from the wildfires occurring during the Alaskan summer, persistence and systematic evolution of the large-scale climate patterns of which they are part allows for limited predictability of area burned. This model's preseason prediction of 2010 annual area burned is 3,055,050 acres in Alaska, represented by the upper red dot in the previous figure. If this forecast proves true, it will be the 6th-highest season of acres burned in the 55-year Alaskan fire record shown in the figure above. However, tests of past performance show that this model is unsuitable for predicting exact values in acres, so the 2010 outlook from this model is best presented as a high or above-average area burned.

In summary, both experimental forecasts for the 2010 wildfire season predict the season will be in the upper third of the annual burn areas since 1955, with forecasts of 1.57 million and 3.05 million acres burned.

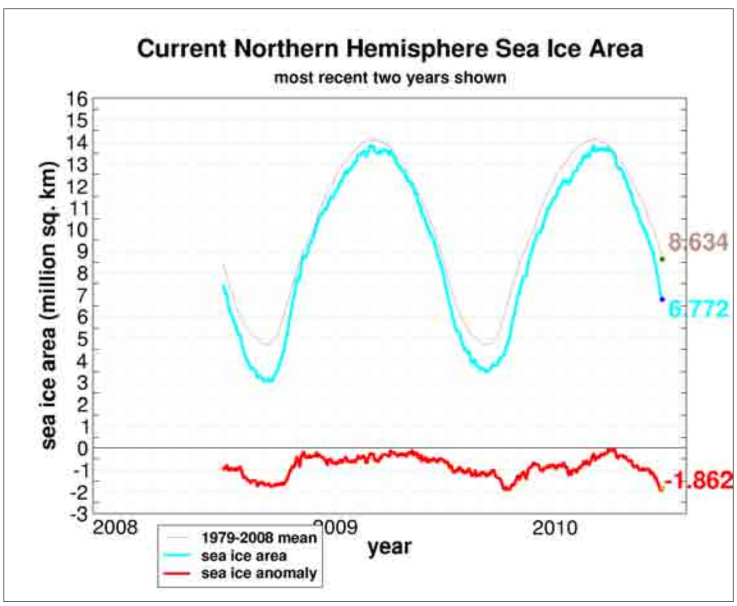
# Summer Sea Ice Outlook




*Ice concentrations (in percent) for Arctic sea ice on June 1, 2010.*
*http://arctic.atmos.uiuc.edu/cryosphere/*

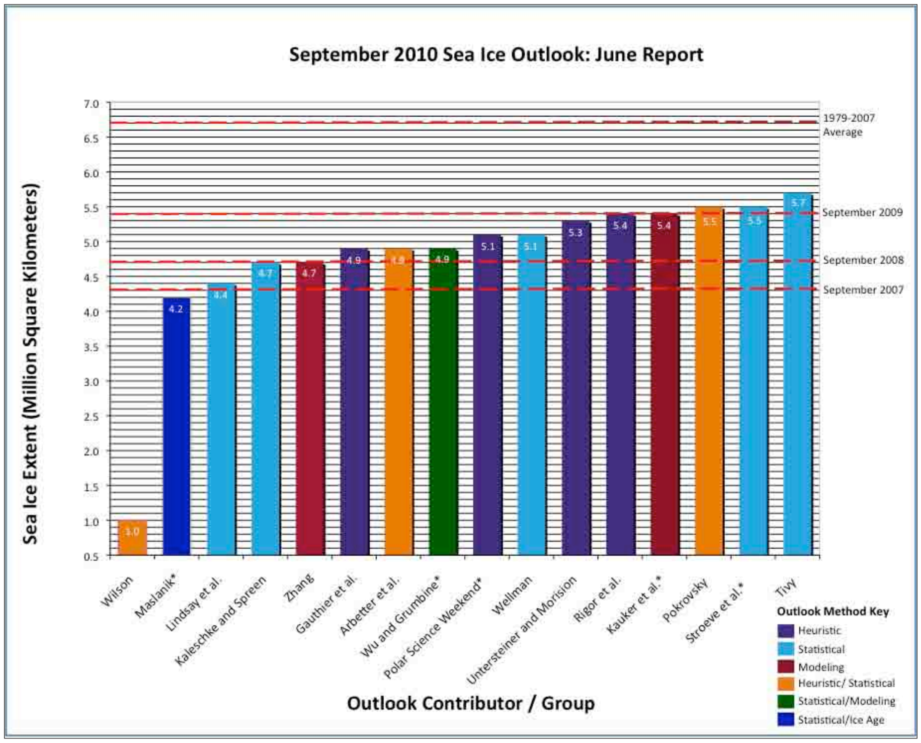
Arctic sea ice has undergone a remarkable retreat during the past several summers. The ice remaining at the time of the minimum extent in September 2007 was approximately 40% less than at the time of the minimum 30 years ago. In 2008 and 2009, the summer minimum did not match the record set in 2007 but was still extreme by historical standards, especially in the Chukchi and Beaufort Seas. The extreme summer retreats appear to result from a combination of export of older, thicker ice to the North Atlantic; warming of the underlying ocean waters that enter the Arctic Ocean from the Atlantic and the Pacific Oceans; and, especially in 2007, unusual wind patterns. Interestingly, the wintertime ice extent has come back to nearly its historical norm in recent years. This means a large area of first-year (seasonal) ice is relatively thin and prone to melt during the spring and summer. The wintertime recovery has been especially noticeable in the Bering Sea, where the extent of ice in February and March actually exceeded its long-term average during the past two winters. The ice along the western Alaska coast was unusually persistent in the spring of 2010. Even at the start of the summer season (June 1), some ice remained along the coast of western Alaska, as shown on the previous page, in the color-coded map of ice concentrations. The figure below shows the winter recovery and the following rapid loss of ice by melt during the past two years. As of June 1, 2010, the ice-covered area was about one million square kilometers below the 30-year (1979-2008) average for the date. Will the summer of 2010 bring another extreme retreat of Arctic sea ice?

For the past two years, a summer sea ice outlook has been prepared with the support of the National Science Foundation and NOAA through the SEARCH (Study of Environmental Arctic Change) Program (http://www.arcus.org/search/seaiceoutlook/).




***Winter recovery and the following rapid loss of ice by melt during the past two years. http://www.arcus.org/search/seaiceoutlook/index.php***

The dissemination of the Outlook is coordinated by the Arctic Research Consortium of the United States. The outlook is based on forecasts provided by individuals and groups of international sea ice experts. The forecasts are made using a variety of different approaches, ranging from dynamical sea ice models to statistical and heuristic methods. The forecasters try to capture the average ice extent for the month of September, which is generally the month of minimum sea ice extent. The various forecasts of the




***Forecasts shown by contributor and forecast method. http://www.arcus.org/search/seaiceoutlook/index.php***

September 2010 ice extent are summarized in the above figure. The range among the forecasts provides one way to measure uncertainty in the forecasts. However, taking an average of many different weather and/or climate forecasts generally gives more accurate results in the long run than relying on individual forecasts or models. Therefore the median all 16 forecasts is especially noteworthy. The median forecast of the 2010 September extent is 5.0 million square kilometers, which is higher than the 2007 value (4.4 million square kilometers), but less than the 5.4 million square kilometers of September 2009. The eyes of all ice forecasters – and many others who use sea ice information – will be on the ice retreat that occurs over the next several months.

The state of the ice cover may be monitored on a daily basis at several websites:

- http://nsidc.org/data/seaice_index/
- http://arctic.atmos.uiuc.edu/cryosphere/
- http://www.ijis.iarc.uaf.edu/cgi-bin/seaice-monitor.cgi?lang=e

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