

Arctic Seafloor Mapping Project Web Site - [arcticseafloormapping.gov](http://arcticseafloormapping.gov)



[2010 Mission](#)



[Mission Plan](#)



[Law of the Sea](#)



[Continental Shelf](#)



[USCGC Healy](#)



[CCGS Louis S. St-Laurent](#)



[Healy's Science Team](#)



[Teachers](#)

## Above the Arctic Circle— "Blue Noses, Beware!"

August 29, 2010

By Helen Gibbons, Web Coordinator, ECS Project

Date: August 29, 2010  
 Time: 1600 hours Pacific Daylight Time  
 Latitude: 80°03.14'N  
 Longitude: 125°40.30'W  
 Air temperature: -0.6°C (31°F)  
 Sea temperature: -1.7°C (29°F)  
 Wind speed and direction: 6 knots from the west  
 Ship's speed over the ground: 8.7 knots  
 Water depth: 2,834 m

Way back on August 4, shortly after we had passed north from the Bering Strait into the Chukchi Sea, we crossed the Arctic Circle. As we crossed, at about 2030 hours Alaska Daylight Time, one of the watchstanders on the bridge announced:

"Now, for the information of all hands, Cutter *Healy* has crossed the Arctic Circle, into the cold, inhospitable waters of King Neptune. Welcome back, Polar Bears! All Blue Noses, beware!"



We crossed the Arctic Circle at about 2030 hours Alaska Daylight Time on August 4, 2010. Click image for larger view. **Credit:** Helen Gibbons, ECS Project.



BM3 Patrick Kimmel announces the crossing of the Arctic Circle. Click image for larger view. **Credit:** MK2 Chris Schumacher, U.S. Coast Guard.

It wasn't until this weekend that the full significance of that statement became clear to us Blue Noses (sailors who have crossed the Arctic Circle for the first time and have not yet been initiated as Polar Bears). I'll get to that after a discussion of the imaginary line at the root of the recent excitement on the ship: the Arctic Circle.

The Arctic Circle—at latitude 66°33'44"N in 2010—is the southernmost limit of 24-hour daylight, which occurs, theoretically, one day a year at the Circle, on the June solstice. Likewise, it is the southernmost limit of 24-hour darkness, which occurs one day a year on the December solstice. (The reality is not so tidy: refraction by the atmosphere, the fact that the sun is a disk rather than a point, and elevation above sea level allow part of the midnight sun to be seen south of the Arctic Circle on the June



[Hourly Photos from Healy's Aloft Conn](#)



[USCG Logs](#)



[Photos of the Day](#)



[Sep 05 Log](#)



[Aug 29 Log](#)



[Aug 28 Log](#)



[Aug 25 Log](#)



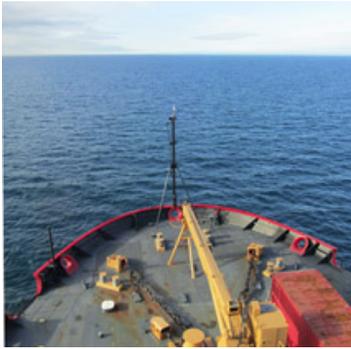
[Aug 24 Log](#)



[Aug 23 Log](#)



[Aug 22b Log](#)



View from the bridge as *Healy* crossed the Arctic Circle. The watchstanders urged us to look for a color change between the waters south and north of the Circle. Click image for larger view. **Credit:** Helen Gibbons, ECS Project.

solstice, and part of the noon sun to be seen north of the Circle on the December solstice.)

North of the Arctic Circle, during northern hemisphere summer, the sun will be above the horizon continually for a number of days each year, that number increasing with latitude until, at the North Pole, the sun stays above the horizon all day every day from the March equinox until the September equinox. Likewise, above the Arctic Circle during northern hemisphere winter, the sun will be below the horizon for a number of days, that number increasing with latitude until, at the North Pole, the sun is below the horizon from the September equinox until the March equinox. (The same patterns hold for the Antarctic Circle and the South Pole, with the seasons of darkness and light reversed.)

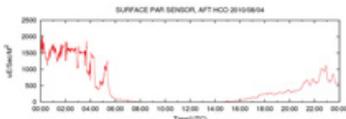
We crossed the Arctic Circle in early August, and so we missed the one day of the year (the June

solstice) when the sun was above the horizon for 24 hours at the Circle. Traveling above the Arctic Circle, we continued to have sunsets and sunrises for many days. As we moved farther north, however, we eventually reached latitudes high enough to put us in the land of 24-hour daylight. The first such day was August 23, at approximate latitude 78°42'N, when the sun at local midnight stayed above the horizon.

Days of low clouds and fog with only occasional clearing prevented us from visually following the sun's movements through the sky, but a look at photosynthetically active radiation (PAR) data collected each day by a sensor on *Healy* indicates that we have had continual daylight from August 23 through today, August 29.

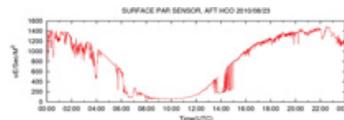


The sun at local midnight, just before 0300 Pacific Daylight Time, on August 23, the first day of our trip on which the sun did not set. Taken at approx latitude 78°42'N, longitude 147°50'W. Click image for larger view. **Credit:** Jerry Hyman, National Geospatial-Intelligence Agency.



Photosynthetically active radiation (PAR) data for August 5, 2010 UTC (Universal Coordinated Time; subtract 8 to convert to Alaska Daylight Time). We crossed the Arctic Circle at about 0430 hrs UTC (2030 hrs on August 4, Alaska Daylight Time). The data indicate that the sun set a little after 0800 hours UTC (midnight ADT) and rose a little before 1400 hrs UTC (0600 hrs ADT).  $\mu\text{E}/\text{Sec}/\text{M}^2$ , micro-Einsteins (a measure of solar flux) per second per square meter. Click image for larger view. **Credit:** Steve Roberts, National Center for Atmospheric Research.

The Arctic Circle is one of four major circles of latitude that mark limits to the angles at which the sun's rays strike the earth over the course of the year—the other three are the Antarctic Circle, the Tropic of Cancer (northern hemisphere), and the Tropic of Capricorn (southern hemisphere). Seasonal changes in the angles of the sun's rays arise from the fact that the earth's axis of rotation is not perpendicular to the plane of its orbit around the sun, but is tilted. The angle of that tilt determines the positions of the Tropics of Cancer and Capricorn—the northernmost (Tropic of Cancer) and southernmost (Tropic of Capricorn) latitudes at which



PAR data for August 23, 2010 UTC. At local midnight, a little before 1000 hrs UTC (0300 hrs Pacific Daylight Time), photosynthetically active radiation from the sun was greater than zero; the sun was low, but still above the horizon. Click image for larger view. **Credit:** Steve Roberts, National Center for Atmospheric Research.

the sun will be directly overhead at least once a year (at the June solstice and December solstice, respectively)—and of the Arctic and Antarctic Circles.

To complicate matters, the tilt of the earth's axis is not constant but fluctuates in



[Aug 22a Log](#)



[Aug 21 Log](#)



[Aug 20 Log](#)



[Aug 18 Log](#)



[Aug 17 Log](#)



[Aug 11 Log](#)



[Aug 08 Log](#)



[Aug 07 Log](#)



[Aug 06 Log](#)



[Aug 04 Log](#)



[Aug 03 Log](#)



[Photo Log](#)

response to several superimposed cycles, the main one producing a variation of approximately 2° over a period of about 40,000 years. According to Wikipedia ([http://en.wikipedia.org/wiki/Circle\\_of\\_latitude](http://en.wikipedia.org/wiki/Circle_of_latitude)), the tilt of the earth's axis in 2010 is 23°26'16". The latitudes of the Tropics of Cancer and Capricorn are equal to that tilt: 23°26'16"N and 23°26'16"S, respectively, in 2010. The latitudes of the Arctic and Antarctic circles are equal to 90° minus the tilt of the earth's axis, or (in 2010) 66°33'44"N and 66°33'44"S, respectively.

## Blue Noses and Polar Bears

A couple of weeks after we had crossed the Arctic Circle, the Blue Noses among us (those who had just made their first crossing of the Arctic Circle by ship) were invited to sign up for initiation as Polar Bears. The initiation is a centuries-old custom designed to establish trust and loyalty among shipmates and friends. The ritual is kinder and gentler today than it was 100s or even 10s of years ago, and many of the Blue Noses in the science party and on the ship's crew signed up to participate.



Captain Davey Jones (a.k.a. FS3 Tysin Alley). Click image for larger view. **Credit:** MK2 Chris Schumacher, U.S. Coast Guard.

On Friday, August 20, Captain Davey Jones, our guide through the initiation process, made his first appearance. He looked over the Blue Noses aspiring to be Polar Bears, insulted us, and stalked off. He reappeared at odd intervals over the following week to set us nearly impossible tasks and build our suspense. Toward the end of the week, the training activities became intense and culminated in our initiation as Polar Bears on Saturday, August 28.

We are



A few of the new Polar Bears, who have earned the right to wear their red caps above the Arctic Circle. Left to right: David Street (Canadian Hydrographic Service), Helen Gibbons (USGS), Jenny White (USGS), Brian Edwards (USGS), and Pete Dal Ferro (USGS). Click image for larger view.

**Credit:** Mark Patsavas, University of South Florida.



Captain Davey Jones (right) and his Wench (a.k.a. SN Beth Hildebrand) train Blue Noses for their Polar Bear initiation. Click image for larger view. **Credit:** MK2 Chris Schumacher, U.S. Coast Guard.

supposed to guard the mystique of the Polar Bear initiation, so I'll try not to disclose too much. I will tell you that it involved helping with some of

the daily work of our Polar Bear mentors—all Coasties—which was a fun way to get to know the crew members and to appreciate how hard they work. There were silly activities, cold and uncomfortable activities, some embarrassing moments, and some very entertaining times. I am happy to be a member of the group of newly minted Polar Bears, for whom the Arctic Circle now has extra significance.

