

Introduction to Arctic Weather

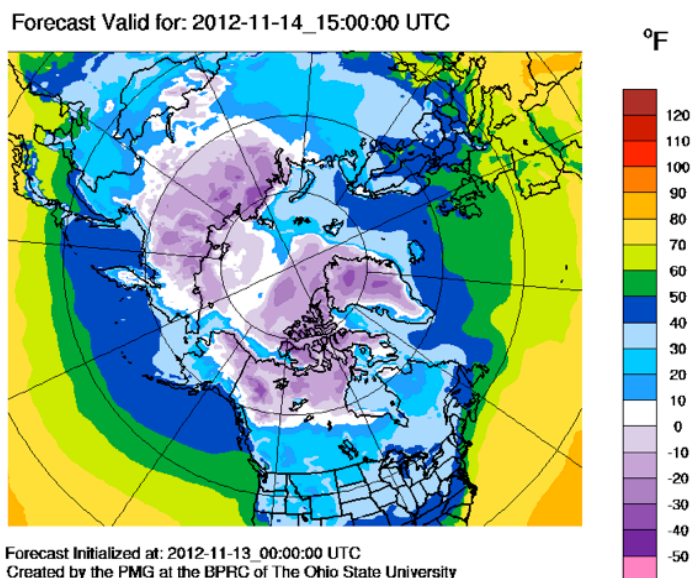
History of the Project

The [Columbus Zoo and Aquarium](#) (Zoo) opened their new *Polar Frontier* exhibit on May 6, 2010. The exhibit features 3 polar bears, 2 grizzly bears, and 4 Arctic fox...along with displays and games that illustrate the habits and habitat for these and other Arctic animals.

With grant support from the [Office of University Outreach and Engagement](#) at The Ohio State University, [Battelle](#), and in collaboration with educators and exhibit designers for the Zoo, cutting edge research from the [Byrd Polar Research Center](#) (BPRC) at Ohio State was included in the new exhibit. The *Battelle Ice Bear Outpost* - the interpretive center for the *Polar Frontier* exhibit - includes research from BPRC scientists along with games and other displays for Zoo visitors of all ages.

The design team thought it would be interesting to show Zoo visitors the real-time conditions being experienced by Arctic animals. To accomplish this, Aaron Wilson, who was then an OSU Master's degree student in Atmospheric Sciences, spent about a year modifying the Polar Weather and Research Forecast model (Polar WRF - pronounced like "wharf") to illustrate Arctic weather in a colorful and easily understandable format, similar to weather maps shown in *USA Today*. (See below.)

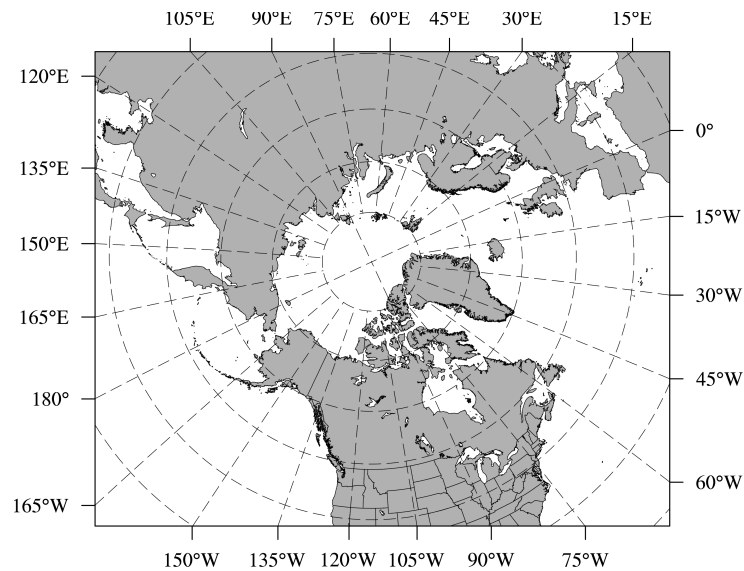
SURFACE AIR & SEA SURFACE TEMPERATURE



Graphics from Polar WRF

Maps generated as outputs from Polar WRF extend considerably south of the Arctic Region. The "domain" (or area) covered by the model was set to extend as far south as Japan, so that the southern extent of sea ice could also be shown, and to include the major watersheds affecting the Arctic (e.g., The Mackenzie River Basin in North America). As you can see in the graphic on the next page, many states in the continental U.S. are represented on the maps. But students from Korea; much of Russia, Japan, and

Europe; and parts of the Mideast, North Africa, Mongolia, and China should also be able to use data and graphics archived on the BPRC website.



Ideas for Investigations

Students can select a series of images from the archive to investigate a particular time period in recent Arctic weather. For example, they might use selected images to draw assess the accuracy of the Polar WRF forecasts by checking them against observations and conditions reported by another weather service. Or they might compare the Polar WRF forecasts to forecasts for the same period generated by another service (such as the National Weather Service) to learn where and how they differ. Sending the students' analyses of a set of images to the Education Outreach Coordinator at BPRC can provide us with details that can help the Polar Meteorology Group to further revise and adapt the model in the future.

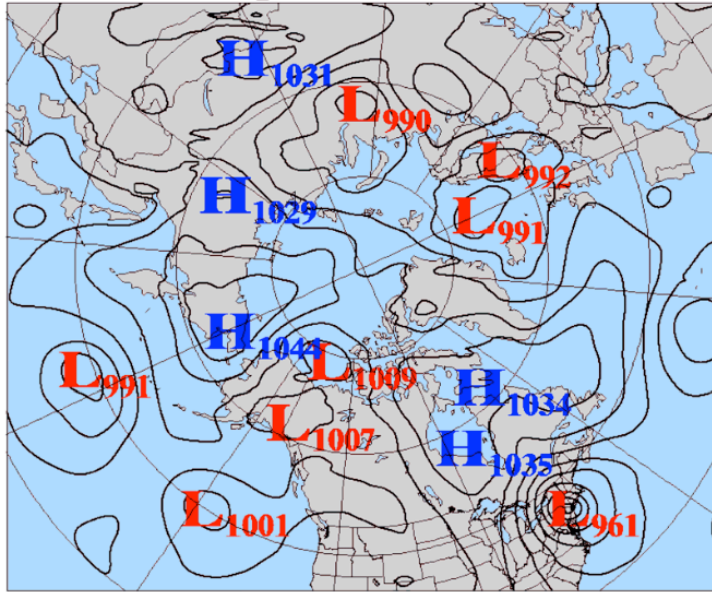
Polar WRF, on display at the Columbus Zoo & Aquarium

Polar WRF was developed at BPRC in 2008. It is a very important research tool for meteorologists who focus on the polar regions. It adapts the standard Weather Research and Forecasting model outputs that are used by the National Weather Service (designed for the mid-latitude regions) to more accurately represent conditions in both Polar Regions.

This project, developed for the Zoo's *Polar Frontier* exhibit, further refined Polar WRF's model outputs to generate visual graphics for use by the public. Aaron wrote a program that adapts Polar WRF data to generate a set of color-coded maps showing near-surface air temperatures (colored map above), and another set of maps showing atmospheric pressure at sea level (example shown on the next page). The sea-level pressure maps include isobars and identify high and low pressure areas in the region.

SEA LEVEL PRESSURE

Forecast Valid for: 2012-10-30 00:00:00 UTC



Forecast initialized at: 2012-10-30 00:00:00 UTC
Created by the PMG at the BPRC of The Ohio State University

The Polar WRF model also generates 96-hour forecasts for both temperature and sea level pressure, both of which are updated every 12 hours. [The series of images generated from Polar WRF](#) for this project have been archived at BPRC since May 3, 2010...just days before the opening of *Polar Frontier* at the Zoo.

This archive of images from Polar WRF provides a unique opportunity for students to consider the range of conditions experienced by people and other animals in the Arctic. Students can use the archive to study past conditions from May 3, 2010, to the present. It also enables investigations that compare the accuracy of Polar WRF model forecasts with weather forecasts issued by the National Weather Service and other forecast providers.

Note: Students may elect to study temperature or pressure, or both, depending on their areas of interest. Some students may be particularly interested in viewing the [animated pressure maps](#) on the BPRC website. The animation is only available for the current day, but it can be used to illustrate general features of air circulation in the Arctic region and may serve as an interest "hook" if a particularly high- or low-pressure area is active in the region at the time.