Arctic Ice-Capable Ships and Bases Codebook

The purpose of these datasets is to measure changes in the ice-capable ships and bases of the five Arctic states that border the Arctic Ocean (United States, Canada, Denmark, Norway, and Russia) before and after the climate shock in the summer of 2007. To assess this change, we begin by coding what a ship's or base's status was on January 1, 1997, approximately 10 years before the shock. This status includes ships that were commissioned as well as ships that were announced, under-construction or built as of January 1, 1997. We then assess whether there was change in the ship's bases or status, or whether new ships and bases were announced, under-construction or built in the following two time periods: 1) The Pre-Shock period which starts on January 1, 1997 and ends on June 30, 2007; and 2) The Post-Shock period which starts on July 1, 2007 and ends on December 31, 2017. For a more in-depth discussion of why these time periods were chosen see Appendix Section B. Defense of the Timing and Use of the Shock.

Data on Icebreakers and Ice-hardened Ships

This dataset includes icebreakers and ice-hardened patrol ships or warships capable of operating in Arctic waters for the five Arctic states under study (United States, Canada, Denmark, Norway, and Russia). This data only includes ships that are state-owned or owned by a state-controlled firm.[1] The dataset does not include: 1) submarines whose hulls have been ice-hardened; 2) cargo ships that have been ice-hardened; and 3) icebreakers or ice-hardened ships known to be permanently stationed in non-Arctic locations (i.e., *US Palmer [Antarctica]*, *US Mackinaw [Great Lakes]* and Russia's *Buran [Baltic]*).

Borrowing from the US Coast Guard and 2007 National Research Council Report on Polar Icebreakers in Changing World, we identify a ship as being able to operate in the Arctic if it meets one of three conditions.[2]

1) An ice-hardened ship with at least 10,000 BHP (Brake Horsepower), which is proxied as a ship with a displacement of 3,000 tons or more.[3]
2) An ice-hardened ship that a reliable source designated as an Arctic-specific asset capable of operating in the Arctic.
3) An ice-hardened ship that had been deployed on Arctic-specific missions (e.g., Denmark's 300-ton Arctic patrol ships).

Thus, in this dataset, we include any ship that meets one of the first three conditions and is also state-owned or owned by a state-controlled firm.

[1] Thus, we include both military and civilian ships, so long as they are owned by the state or a state-controlled firm. (This was to account for the large number of Russian ships owned by state-controlled companies.) Due to this requirement, icebreakers like the *Aiviq* [owned by Edison Chouest Offshore] were not included.

[2] National Research Council (U.S.), ed., *Polar Icebreakers in a Changing World: An Assessment of U.S. Needs* (Washington, DC: National Academies Press, 2007).

[3] The US Coast Guard counts ships with 10,000 Brake Horsepower or greater as being light ice-breakers and includes them in their list of ships having the capacity to operate in the Arctic. Because data on horsepower was not widely available, we chose to use tonnage as a rough proxy for the horsepower of a ship. Given that nearly all of the ships included in the Coast Guard's list displaced 3,000 tons or more, we generally chose to use 3,000 tons as a threshold of inclusion. Following the Coast Guard, we did include ships below this threshold if we had evidence that the ship was capable of operating in the Arctic. For more on this, see "Major Icebreakers of the World." (United States Coast Guard, May 1, 2017).

For the ships identified by this definition, the following attributes were coded:

Indicator	Attribute	Type of Data
Icebreakers	Coast Guard Listed	Boolean (0,1)
	Name	Name of Ship
	Country	Country of Ownership
	Date Announced	Date
	Budget Allocated	
	Construction Started	
	Date of Commission	
	Date of Planned Commission	
	Date Removed from Service	
	Date Returned to Service	
	Date of Decommission	
	Approximate Commission Date	Boolean (0,1)
	Planned Commission	
	Active	
	Built After June 30 2007	
	IMO Number	Number
	Tonnage GWT	Tons
	Tonnage GWT Estimated	Boolean (0,1)
	Displacement	Tons
	Displacement Estimated	Boolean (0,1)
	Length	Meters
	Beam	Meters
	Draught	Knots
	Max Speed	
	Range	Nautical Miles
	Warship/Patrol Ship	Boolean (0,1)
	Research/Survey	Boolean (0,1)
	Nuclear Power	Categorical [NA, Announced, Under Construction, Built Pre-/Post-/Pre-1997]
	Status Pre-1997	
	Status Pre-Shock	Categorical [NA, Announced, Under Construction, Built Pre-/Post-/Pre-1997]
	Status Post-Shock	

Descriptions of Variables

The purpose of this codebook is to provide details regarding each of the variables that were coded in the Arctic Icebreakers and Ice-Hardened Warships Dataset. A lengthier document that provides additional details regarding the data collection methods and data production procedures is available upon request from the author.

Coast Guard Listed:
Marked 1 if included in their list, marked 0 if not included in their list of Icebreakers.[4]

Name:
The official name of the vessel.

Country:
The name of the country that is currently in control of the vessel. This may differ from the country where the ship was originally built.

Date Announced:
Marks the earliest date that a government official formally announces action regarding building the icebreaker. It should be noted that this differs from an intent or campaign promise to build. As an example, Stephen Harper's campaign promise in January 2006 to budget over 5 billion dollars to build icebreakers is not coded because it only marks an intent. However, his announcement in July 2007 to build six to eight patrol ships with ice-strengthened hulls is counted because it is an executive plan, not a campaign promise. If the announcement date and year are unknown, the variable is left blank. If approximate, date approximations are used as described in the Military Activity Events codebook. If a date cannot be approximated and only a year is given, then the date is coded as being January 1 of the year. For example, if a date includes just the year a ship was commissioned, e.g., 2006 then the date of commission would be 01/01/2006. This is also relevant for all future attributes that are coded as a date.

Budget Allocated:
Marks the date when a specific amount of money in a state's budget is allocated for the building of icebreakers. If not applicable or unknown, it is left blank.

Construction Started:
Marks the date when construction is started on a vessel, namely when its keel is laid down. If not applicable or unknown, it is left blank.

Date of Commission:
Marks the date when the ship is officially commissioned. If the ship has not yet been commissioned or if not applicable or unknown, it is left blank.

[4] See the "Major Icebreakers of the World" chart for the U.S. Coast Guards list of Ice-breakers.

Date of Planned Commission:
Marks the date that the ship is intended to be commissioned. A ship cannot have both a "Date of Planned Commission" and a "Date of Commission." If not applicable or unknown, it is left blank.

Date Removed from Service:
Marks the date where a ship is removed from service, put on "commissioned inactive" status or otherwise rendered inactive for a period of time but not officially decommissioned. If not applicable or unknown, it is left blank.

Date Returned to Service:
Marks the date a ship returns to service, if it does, after being removed from service. If not applicable or unknown, it is left blank.

Date of Decommission:
Marks the date where the ship was officially taken out of commission. If not applicable, it is left blank. A ship is defined as being officially taken out of commission when an official of a representative body directly says so. It should be noted that a ship being "mothballed" but maintained for future use does not qualify for our definition, as it can be reasonably put back into commission at any time. When a ship becomes decommissioned, it is common for it to be stripped down or, in some cases, used for target practice, which is why the distinction is made between decommissioning and mothballing. If a ship is mothballed, it is coded as "Removed from Service."

Approximate Commission Date:
If the date in Date of Commission is approximate it is coded as 1, otherwise it is coded as 0.

Planned Commission:
If the ship has yet to be commissioned it is coded as 1, otherwise it is coded as 0.

Active:
If the ship is active, it is coded as 1, otherwise if the ship is decommissioned it is coded as 0.

Built After June 30, 2007*:*
If the Date Commissioned is after June 30, 2007, it is coded as 1, otherwise it is coded as 0. This accounts for whether the decision to build the icebreaker occurred after the shock.

IMO Number:
The unique identification number given to the ship by the International Maritime Organization.

Tonnage GWT:
Short for Tonnage Gross Weight, equivalent to 1/100 times the amount of cubic feet. Serves as an approximation of tonnage. Measured in metric tons.

Tonnage GWT (estimated):
If tonnage was estimated via conversion from displacement, it is coded as 1, otherwise it is coded as 0.

Displacement:
Equivalent to the total weight of the water displaced by the ship when sitting in the water. For certain ships, no displacement figures were available. For these vessels, we have estimated displacement in accordance with the equation for displacement outlined in *Practical Ship Design* by D.G.M. Watson.[5]

Displacement (estimated):
If displacement was estimated from ship dimensions, it is coded as 1, otherwise it is coded as 0.

Length:
Distance between the extreme points of the ship, as measured in meters.

Beam:
The width of the ship at its widest point, as measured in meters.

Draught:
Distance between the water line and the bottom of the ship's hull.

Max Speed:
The fastest that a ship has reportedly gone, as measured in knots.

Range:
The range of the ship in nautical miles.

Warship/Patrol Ship:
If there is evidence that the ship has been or is being used for patrolling claimed territory, it is coded as 1, otherwise it is coded as 0. For the ship to be coded as 1, a source must have explicitly stated that the ship functions to patrol waters.

Research/Survey:
If the ship is either exclusively marked for research or owned by a government office that exclusively performs research or mapping, it is coded as 1, otherwise it is coded as 0.

Nuclear Power:
If the ship is nuclear powered, it is coded as 1, otherwise it is coded as 0.

[5] David G. M. Watson, *Practical Ship Design*, 1st ed, Elsevier Ocean Engineering Book Series, v. 1 (Amsterdam ; New York: Elsevier, 1998).

Status Pre-1997:
This category is used to code the status of the ship as of January 1, 1997. It is coded as "Built Pre-1997" if the commission date is before 01/01/97. However, it is coded as "NA" if the ship has yet to be announced, "Under Construction" if the ship was in the process of being constructed (construction date is pre-01/01/97 but has yet to be commissioned), and coded as "Announced" if date of announcement is pre-01/01/97 but construction has yet to commence.

Status Pre-Shock:
This category is used to code the "Pre-Shock" status of the ship. It is the ship's status as of June 30, 2007. If the commission date is before 01/01/97, then it is coded as "Built Pre-1997." If the commission date is between 01/01/97 and 06/30/07, then it is coded as "Built Pre-Shock." If the ship has yet to be announced, it is coded as "NA." It is coded as "Under Construction" if the ship was in the process of being constructed (construction date is between 01/01/97 and 06/30/07 but has yet to be commissioned). It is coded as "Announced" if date of announcement is between 01/01/97 and 06/30/07 but construction has yet to commence. It is coded as "Removed from Service" if the ship was removed from service between 01/01/97 and 06/30/07, and finally, it is coded as "Returned to Service" if the ship was returned to service in the Pre-Shock period.

Status Post-Shock:
This category is used to the code the "Post-Shock" status of the ship. It is the ship's status as of December 31, 2017. It is coded as "Built Pre-1997" if the commission date is before 01/01/97. It is coded as "Built Pre-Shock" if the commission date is between 01/01/97 and 06/30/07. It is coded as "Under Construction" if the ship was in the process of being constructed (construction date is later than 06/30/07 but has yet to be commissioned or the commission date is later than 12/31/17). It is coded as "Announced" if the date of announcement is later than 06/30/07 but construction has yet to commence as of 12/31/17. It is coded as "Removed from Service" if the ship has been removed from service between 06/30/07 and 12/31/17, and it is coded as "Returned to Service" if the ship has been returned to service in the Post-Shock period.

Notes: This includes any other miscellaneous details about the ship.

Sources 1-3: Lists the source information used to code the data.

Cites 1-2: Includes bibliographic information of each of the respective sources. The long form of these citations is available by request from the author.

Date Accessed: The date the source was originally accessed.

Data on Arctic Bases

This data set includes all bases located in the Arctic, defined as bases whose location is at or above the Arctic Circle.[6] A base is defined as any government-owned facility that can support troops for at least half the year and either permanently hosts troops or maintains important military vehicles/tools of operation. The half-year benchmark is chosen because, due to the harsh winters, bases exceptionally far North often do not run year-round, but are still important for states' projection of power. Bases with unclear levels of activity are still included in the dataset in order to err on the side of inclusion rather than exclusion.

For the bases identified by this definition, the following attributes were coded:

Indicator	**Attribute**	**Type of Data**
Bases	**Name**	**Name of Base**
	Country	Country of Ownership
	Announcement Date	Date
	Initial Date of Installment	
	Decommissioned	Boolean (0,1)
	Date of Decommission	Date
	Reinstated	Boolean (0,1)
	Date of Reinstatement	Date
	In Arctic Circle	Boolean (0,1)
	Planes	
	Ships	
	Post-Shock Upgrades	
	Date of First Upgrade	Date
	Date of Second Upgrade	Date
	Number of Permanent Personnel	Number
	Latitude (N)	Decimal Number
	Longitude	
	Operating July 1, 2007	Boolean (0,1)
	Active/Announced July 1, 2007	
	Re-opened	
	Status Pre-1997	Categorical [NA, Upgraded, Closed, Build Pre-1997/Pre-/Post-Shock]
	Status Pre-Shock	
	Status Post-Shock	

[6] We adopt the commonly used definition of the Arctic circle as 66.3 degrees North latitude (i.e., north of the equator).

Descriptions of Variables

Name:
Name of the base in English. If base goes by multiple common names, it will list all common names separated by a forward slash.

Country:
Name of the country with the most recent ownership of the base.

Announcement Date:
Marks the date that the base was first announced. A base is considered announced if government officials detail plans to start construction of the base at a specific location.

Initial Date of Installment:
Marks the date that the base first became active. A base is defined as active when it is either announced to be operational or when signs of operation of the base are first noted. It is left blank if unknown.

Notes 1: This includes any notes on the announcements or initial date of commission.

Decommissioned:
If the base has been decommissioned at any point in its lifetime, it is coded as 1, otherwise it is coded as 0. A base is only considered decommissioned if a government official specifically says it is or if there is significant evidence that it is limited to no activity.

Date of Decommission:
If "Decommissioned" is coded as a 0, then this cell is coded as "NA;" if coded 1, then the date the base was formally decommissioned is coded.

Notes 2: This includes any notes on the decommission.

Reinstated:
If the base was once decommissioned and has been reinstated to be operational since its closure, it is coded as 1, otherwise it is coded as 0. Operationality is determined by an announcement by a government agency or notable signs of activity.

Date of Reinstatement:
If "Reinstated" is coded as 0, then it is coded as "NA." Otherwise, the date on which the base became operational again is coded.

Notes 3: This includes any notes on the reinstatement.

In Arctic Circle:
If the base is above 66.3 degrees North latitude it is coded as 1, otherwise it is coded as 0. All bases at this time should be coded as 1.

Planes:
If the facility has an operational runway, it is coded as 1, otherwise it is coded as 0. A runway is considered operational if planes at least the size of fighters can land and take off.

Ships:
If the facility can permanently host and maintain ships, it is coded as 1, otherwise it is coded as 0.

Post-Shock Upgrade:
If the base has been upgraded since July 1, 2007, it is coded as 1, otherwise it is coded as 0. This may also be used as evidence of a Post-Shock change. Upgrades include physical construction or improvement to the base (i.e., expansion or modernization). Bases are also considered upgraded in the Post-Shock period if a headquarters has been relocated there (i.e., Norway moving Coast Guard headquarters to Sortland) as it marks a base increasing in importance for the state and upgrades were needed to accommodate the increased number of permanent staff.

Date of Upgrades:
If "Recent Upgrades" is coded as 0, then it is coded as "NA." Otherwise, the date that the upgrades were completed is coded. If the updates have not finished, the expected date of completion is coded.

Date of Upgrades 2:
This includes the date of a second upgrade to the base.

Notes 4: This includes any notes on the upgrades.

Number of Permanent Personnel:
Number of military personnel that are hosted in the base year-round is coded. It is left blank if unknown.

Latitude (N):
The decimal value of the latitude of the base to two decimal points. If north, it is coded as a positive number. If south, it is coded as a negative number.

Longitude:
The decimal value of the longitude of the base to two decimal points. If west, it is coded as a negative number. If east, it is coded as a positive number.

Operating July 1, 2007:

If the base was operational on July 1, 2007, it is coded as 1, otherwise it is coded as 0.

Active/Announced July 1, 2007:
If the base is currently operational or intended to be operational soon, it is coded as 1, otherwise it is coded as 0.

Re-Opened after June 30, 2007:
If "Reinstated" is coded as 1 and "Date of Reinstatement" is after June 30, 2007, it is coded as 1, otherwise it is coded as 0.

Status Pre-1997:
This is the status for the base as of January 1, 1997. If it was decommissioned prior to 01/01/97 but reinstated during the Pre- or Post-Shock period, it is coded as "Closed." If the base is commissioned prior to 01/01/97, then it is coded as "Built Pre-1997." If the base did not exist as of January 1, 1997 or had to be yet announced, it is coded as "NA."

Status Pre-Shock:
The Pre-Shock status of the base considers its status between 01/01/97 and 06/30/07. If it was decommissioned during this time, then it is coded as "Closed." If the base was commissioned prior to 01/01/97, then it is coded as "Built Pre-1997." If it was commissioned between 01/01/97 and 06/30/07, then it is coded as "Built Pre-Shock." If the base was announced during the Pre-Shock period but construction only commenced after 06/30/07, then it is coded as "Announced." If construction starts between 01/01/97 and 06/30/07, then it is coded as "Under Construction." If the base did not exist or had yet to be announced, then it is coded as "NA."

Status Post-Shock:
The Post-Shock status of the base considers its status between 07/01/07 and 12/31/17. If it was decommissioned during this time, then it is coded as "Closed." If the base was commissioned prior to 01/01/97 then it is coded as "Built Pre-1997." If it was commissioned between 01/01/97 and 06/30/07, then it is coded as "Built Pre-Shock." If the base was announced during the Post-Shock period but construction only commenced post-12/31/17 or has yet to commence, then it is coded as "Announced." If construction started between 07/01/07 and 12/31/17, then it is coded as "Under Construction." If the base has been upgraded in the Post-Shock period, it is coded as "Upgraded." If the base was closed during the Pre-1997 and/or Pre-Shock period and was re-opened between 07/01/07 and 12/31/17, it is coded as "Re-Opened." "Re-Opened" takes precedence over "Upgraded" as it is presumed upgrades were entailed in the re-opening. Hence, if a base was upgraded and re-opened should be coded as "Re-Opened."

Notes 5: This includes any additional miscellaneous notes.

Sources: This includes the sources that were used to code the attributes of each of the bases. The bibliographic information of each of the respective sources is available by request from the author.

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Works Cited

"Major Icebreakers of the World." United States Coast Guard, May 1, 2017.

National Research Council (U.S.), ed. *Polar Icebreakers in a Changing World: An Assessment of U.S. Needs*. Washington, DC: National Academies Press, 2007.

Watson, David G. M. *Practical Ship Design*. 1st ed. Elsevier Ocean Engineering Book Series, v. 1. Amsterdam ; New York: Elsevier, 1998.