Arctic Change 2015 – Homework 6  Due 11:30am Monday 18th May 2015 / 50

Goals – to familiarize you with Arctic research vessels, especially the USCGC Healy.
- Fill in Name (Last, first) and student number at the top of all pages, and staple pages together.
- Space indicates expected length of answer, but if you need more space, add extra pages with name and student number at the top, indicating which question you are doing.
- HANDWRITE your answers, show your workings, use metric units, give answers to a reasonable number of significant figures and do your best to make your paper clear and easy to read.
- Although you may discuss the questions with others, complete the homework on your own.

The best way to get to know the USCGC Healy is to come on the tour. Contact us if you still need a time slot for the tour.
If you come on the tour you must:
- preregister with us (if successfully preregistered, you will have a tour time on the class catalyst site);
- bring photo ID with you to the ship (without photo ID you will not be allowed on the base);
- on the day, sign the sign-up list held by us.

Taking part in the tour gives you 35 pts towards this homework and allows you to skip questions 1-3 of this homework. (You can still do questions 1-3 for interest if you want – you’ll still get the 35pts).

*** Those doing the course at 3-credit also all should do the 3-credit assignment (page 5). ***

Did you take part in the tour?
- if yes, you can go to Question 4  
- if no, do all Questions 1-4

For this homework, you will need to find out about the US Icebreakers and the FS Polarstern. (FS= Forschung Schiff = German for research ship). Here are some sites you can start with:  

**Question 1: Basic Icebreaker questions**

/2pts  1a) What is the meaning of the phrase “doubled hulled” ship? Include an estimate of the distance between the hulls. When would a double hull be an advantage?

/1pt  1b) What was the first US surface ship to the North Pole and when did it get there?

/3pt  1c) Describe one recent science mission of the USCGC Healy. Include its location and science goals, and the source of your information.
Question 2: Comparing some research Icebreakers

2a) What do USCGC and RV stand for when used before the name of a ship?

2b) Fill out the table below:

<table>
<thead>
<tr>
<th></th>
<th>USCGC Healy</th>
<th>FS Polarstern</th>
<th>RV Sikuliaq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nationality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall length (m)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width at widest point (m)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draft (m)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date of maiden voyage/commissioning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endurance (i.e. how long a time she can stay out at sea without refueling)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typical number days at sea per year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home port</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Speed (knots)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed through ice (?? knots through ?? m ice)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of crew</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of scientists</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lab facilities for science (fair/med/good)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can take helicopters (yes/no)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Works both Arctic and Antarctic (yes/no)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operated by Coastguard (yes/no)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed or variable pitch propellers?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary and Secondary Missions</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2c) What is meant by variable pitch propellers?

2d) Aside from the Arctic and Antarctic, where does the US use icebreakers?

2e) Describe the main way US scientists get funding/permission to lead a research cruise on the USCGC Healy?
Question 3: Doing Arctic ship-based science

/2pt 3a) What does CTD stand for? What are the uses of a CTD rosette system?

/1pt 3b) What do XBT and XCTD stand for, and what do they measure?

/2pt 3c) Give 2 advantages of XBTs over a CTD rosette system.

/2pt 3d) Give 2 advantages of a CTD rosette system over XCTDs.

/2pt 3e) What does ADCP stand for? What does a hull mounted ADCP measure? On what principle does it work?

/1pt 3f) Name a device on the USCGC Healy used to map the seafloor? Why does the US want to map the Arctic sea floor accurately?
Question 4: Final take home points

/2pts 4a) Sketch the hull shape of a typical icebreaker, marking major features. Discuss how an icebreaker breaks the ice.

/1pt 4b) Which are the most powerful icebreakers in the world?

/2pt 4c) Name 4 countries (aside from the US) which send their ice capable research ships into the Arctic?

/2pt 4d) Which out of the Arctic and Antarctic offers the most challenges to an icebreaker and why?

/2pt 4e) Give 2 reasons why the US needs icebreakers?

/6pt 4f) Name 6 features of the USCGC Healy you found particularly interesting.
Extra assignment for 3 credit option (12 pts)

Read:

Prepare (in your own words) a ~ half page (~ 500word) summary of the main messages of the paper, including details of two of the case studies described. This summary may be handwritten or typed.