

Irminger Sea; Oct 22 - Sidcot School Questions from the students at Sidcot School and answers from Ben Harden

Dear Sidcot students,
Thank you once again for your questions!

On a general note:

The library looks fascinating.....how do the books stay on the shelf when everything flies around during rough weather?
The library is excellent. It is well stocked with a wide selection of books from novels and biographies, to scientific text books and general references. I have found the bird references, for example, useful for identifying the sea birds that have visited the boat over the course of the cruise. It's great to have such a wealth of information and entertainment at your disposal, especially as the internet can often be less than reliable. The book shelves mostly face fore and aft (especially for the large books) and have a removable metal pole slotted in horizontally halfway up each shelf to stop them falling out. This is mostly successful, although there is one pole that likes to spring out across the room from time to time.

Millie would like to know how you receive TV and what channels are available?....and how much free time to you get in the day?
Millie, the TV in the lounge does not receive TV channels because we don't have a subscription nor the satellite dish to get the reception. It is only used for watching videos and DVDs, but thankfully we have enough of these to keep us entertained. They do have TV reception on other research vessels, but apparently it is very expensive- it can be more costly than the internet connection! We are also unsure about whether we would be able to receive satellite TV at such high latitudes anyway. As for the amount of free time we all get, it varies from person to person. In terms of scheduled work, a number of scientists have daily 8 hour watches on the CTD machine and the radiosonde crew accompany them for 6 hours each and then launch balloons as and when this is required. Outside of this, there is generally a very industrious atmosphere as scientists go about analysing the data they are receiving. Dr Bob, for example, has to study the data he gets from the CTD as he goes along to decide which part of the ocean we should investigate next. The radiosonde team have to look at our data along with weather predictions in order to decide on our launching schedule. Most people generally get enough free time to relax though and of course sleep is a popular activity, especially when it is rough!

Jade and Charlie are inquisitive about the creature comforts and wonder if it is cold at night in bed?
Jade and Charlie, it is generally a pleasant temperature for sleeping in the cabins. Each bed has a sheet and woolen blanket to sleep under and this is keeping most warm enough. The rooms have thermostats so you can always crank up the heat if you feel a bit chilly. The heating has broken in some of the rooms though, but portable heaters have been provided to stop the occupants from freezing. My personal problem is that the blanket I've been provided with isn't long enough to cover the whole of my body. With a T-shirt on it is warm enough, but I can say I'm looking forward to my duvet on my return to the UK!

Liam would like to know if you are strapped to the boat during rough weather and has anyone nearly fallen over board?
Liam, during rough weather, working on deck can be quite dangerous as the boat can roll quite violently and waves can come high over the side and flood the deck. You go out in these conditions only if it is necessary, but for most of these activities, you don't have to be strapped in. We have to go out to launch our weather balloons in the rough weather, but as long as we are careful and coordinate the launch with the bridge (who tell us when there is a relatively quiet patch of ocean) then it is quite safe. You have to be prepared to get wet though! It's not just us though, the real heroes are the ship's crew who sometimes have to go out during really rough storms to fix something, often on the bow- the roughest part of the boat! As long as everyone applies their common sense and follow safety procedure there is a little chance of man overboard. No one on this cruise has come close to it thankfully!

Back to Science:

Alice would like to know how many balloons have already been launched?
Alice, so far we have made 44 successful launches. This does not include a number of the failures we have encountered along the way. These include the sonde hitting the water, the balloon popping before launch, and the balloon miraculously and perplexingly escaping from the clip that attaches it to the sonde. Dunking the sondes in the ocean does them no good at all and they cease to work immediately. The reason that a few sondes have hit the water is that after the launch, the string the sonde is on unravels from a length of 1m at the surface to somewhere in the region of 10m when fully extended. If the balloon is released in very strong winds it travels almost straight along the surface of the ocean. If it doesn't climb fast enough, the string unravels and the sonde goes for a swim. We have just launched a balloon that got caught in a down draft and performed a dramatic forward flip- the sonde went all the way over the balloon and narrowly avoided the ocean surface on its return back down! In general we are quite pleased with our success rate considering the conditions. We have 17 sondes left, most of which we will use in the storm that is fast approaching us now.

On a clear day how long, in time, do the balloons stay in sight once you have released them?
From my previous experience with the radiosondes, they can stay visible for some time after a launch. On a clear day and with a keen eye, you can follow them for a minute or more. Where we are, the combination of high wind speeds and the invariably low visibility means we can keep them in sight for about 10 to 20 seconds before they are swallowed by the clouds. Sometimes, at night, the crew on the bridge use their spot lights to follow it up causing it to glow beautifully.

How long does it take the balloons to get to a height at which they burst?

Most of our balloons have gone up to around 7-8km high. This is lower than is common when launching from land when you can track them to 15-20km. It is probably due to the strong winds in the area that move the sondes far from our boat mounted antenna, meaning they get out of range more quickly than they would on land. On average it takes about 40 minutes for the sonde to ascend to 8km (depending on how full the balloon is) which is equivalent to a rate of ascent of about 3 meters per second. I suppose this means that it would take the balloon about an hour and a half to reach the altitude at which it pops!

At what temperature does sea water freeze?

Sea water freezes at a temperature of roughly -2°C . This is because the sea is salty which makes ice formation more difficult than in pure water; Sea ice is mostly salt free and the effort required to displace the salt as the sea water turns to ice is the reason for its lower freezing temperature. The more salt that is needed to be removed, the lower the temperature required for the water to freeze which is why the value of -2°C can change depending on the ocean salinity.

If the return leg of the N. Atlantic current is colder than the surface, is there ice under the surface?

It is not just how salty the water is that affects the freezing temperature of the ocean; pressure also plays an important role. Water is unique among non-metals in that it is the only substance that decreases its density when it freezes. The molecules of all other non-metals become more closely packed when they freeze and become denser. Water does the opposite. The structure of ice is looser than water, the molecules are less closely packed and that makes it less dense than liquid water. This allows ice to float on top of the more dense liquid water, something you will be familiar with when you put ice in a drink to cool it. As water is required to expand on freezing, the pressure of the water is very important. If the pressure is very high, the water struggles to expand when freezing and so requires a lower temperature to do so. This is why the return leg of the North Atlantic current does not freeze, the pressure down there is simply too great to allow it!

Is the pack ice frozen sea water or chunks which have broken off the land?

Pack ice forms on the ocean surface in a number of ways depending on the ocean and atmosphere conditions. It is different from the icebergs that we saw last week, which have broken off the ends of glaciers that feed in to the fjords along the Greenland coast. The wind and currents are very influential in moving the sea ice around and tend to gather it all together in the kind of fields we saw a couple of days ago. As the season progresses, the ice continues to form and is pushed closer together until solid shelves are built up around the coast of Greenland and of course further north in the arctic.

I hope that answers all your questions. Thank you for taking the time to think them up, I hope you have enjoyed it, I've certainly enjoyed answering them. Have a fun half term!

All the best
Ben Harden

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