Print

Irminger Sea: Oct 19
Back to the Barrier by Dallas Murphy

For 16 hours Friday night and Saturday morning we were hove-to in 40-plus knots of wind from the north. The low that caused the storm was centered near that claw-shaped peninsula on the northwest corner of Iceland. (Remember that wind circulates counterclockwise around the center of the low.) The circulation was all disturbed immediately north of Iceland, interrupted by the land. But further north up near the Greenland coast the circular pattern re-established itself, and when the wind encountered the high, vertical coast of Greenland, it was deflected toward the south. And it accelerated to the 45 knots that stopped work aboard *Knorr*.

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This was a textbook example of that barrier wind we discussed in the October 15 dispatch.

Launching their weather balloons, the atmospheric scientists were delighted. This was precisely the phenomenon they had hoped to measure with their radiosondes. The radiosonde is a miniature package of instruments about the size of a fat wallet that measures air temperature, humidity, barometric pressure, and wind speed. The sonde contains a tiny GPS receiver. Since the GPS knows where it is moment to moment, it's easy to calculate the wind speed as well as direction.

"This is interesting," said Ben, one of the atmospheric scientists. "It's blowing 43 knots at sea level along the Greenland barrier. But look, above 3,000 meters [the elevation of Greenland] the wind is blowing 23 knots and from a different direction." There it was, in black and white, so to say: conclusive evidence of the barrier effect.

What follows is a vivid description by Professor Kent Moore, an atmospheric scientist from the University of Toronto, who has studied the barrier wind and that other Greenland influence on storms, the tip jet, described in the October 15 dispatch (Note that Dr. Moore identifies wind speed in meters per second; 30 m/s equals 60 knots!):

" Flying at 100 feet into a 30 m/s barrier wind is a unique experience. Planning such a flight takes over 24 hours and once the flight is planned the die is cast so to speak. We typically did a high level pass over the barrier wind deploying dropsondes (essentially radiosondes on parachutes rather than balloons so that they float downward collecting data on the winds, temperatures and pressures). On such a pass we are high (approx 23000ft) above the barrier flow and so the experience is much like on a commercial aircraft except that the interior is crammed with all sorts of instruments and so noisy that we communicate amongst the crew with headphones. The data tells us if our planning has put the aircraft in the right place and so much of the anxiety vanishes (assuming of course that we were correct in our planning). As the aircraft descends towards the surface, there is time for some last minute fine-tuning of our flight track to take into account changes in the orientation or position of the barrier flow. There is also time to strap into our 5 point harnesses and get prepared for the ride. As the aircraft descends one typically becomes aware of how angry the sea is before one begins to experience the turbulence. Below 1000 feet, one begins to feel the aircraft begin to shudder as the turbulence begins. One of the reasons why I love the sort of research that I do is that I get the opportunity to personally experience the phenomenon that I study. Not many scientists have this opportunity and I relish my time at flying into barrier winds. The turbulence that we measure with our instruments and experience with our bodies tells us important information on the transfer of energy between the atmosphere and ocean. We typically stay at 100 feet for about an hour. It is typically so rough that it is difficult to monitor our instruments or take notes, we are reduced to looking out the window and taking pictures. We are not however on cruise control; there is still the need to try to keep track of what is happening outside as so to maximize the data we are collecting. On occasion, there is the need for some quick thinking as conditions such as aircraft icing or a change in the wind requires a change in flight plans. After our time is over, we rapidly ascend and soon are back in the calm air above the barrier flow. The excitement is over and I typically take a well deserved nap as we ferry back to our operations base."

So what we have here is a perfect example of how pure science works. Nature simply *is*. Mountains form over eons; winds blow; the ocean circulates. First the Earth scientist observes what *is*. He/she collects data. Prof. Moore collects data about the behavior of the atmosphere from an aircraft. Dr. Bob collects data about the behavior of the ocean from a ship. (So, of course, do both their colleagues past and present.) They observe, for instance, that the storm winds seem to bend and accelerate when they encounter the coast of Greenland.

When the volume of data seems sufficient, the scientist begins to ask *why* questions. They formulate an idea, a *hypothesis*. They then conceive an experiment to test their idea in the real world. After conducting their experiment, they decide whether or not the results bear out their hypothesis. Either way, they describe their results and present them to their colleagues and to the public.

Here is a very important point: The highest level of certainty in science is the *theory*. No serious scientist will ever say, "This is absolutely the way it is in nature, no question about it. Period." After all, another scientist, using the same data might someday find a different conclusion, or a new device might be invented capable of collecting better data. On the other hand, when people say, for instance, about Charles Darwin's theory of evolution, "Well, it's just a theory," they miss the point. Darwin published his great book in 1850. Since then thousands of biologists have tested it, yet no one has disproved Darwin's theory.

Irminger-ip imartaani sapaatit kusanarnersaat by Nick M?ller

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Mail: Woods Hole Oceanographic Institution, 266 Woods Hole Road, Woods Hole, MA 02543, USA.
E-Contact: info@whoi.edu; press relations: media@whoi.edu, tel. (508) 457-2000
Problems or questions about the site, please contact webdev@whoi.edu