Beaufort Gyre Exploration Project: Dispatch 23: The Many Faces of Sea Ice

Alex Kain
October 9, 2009

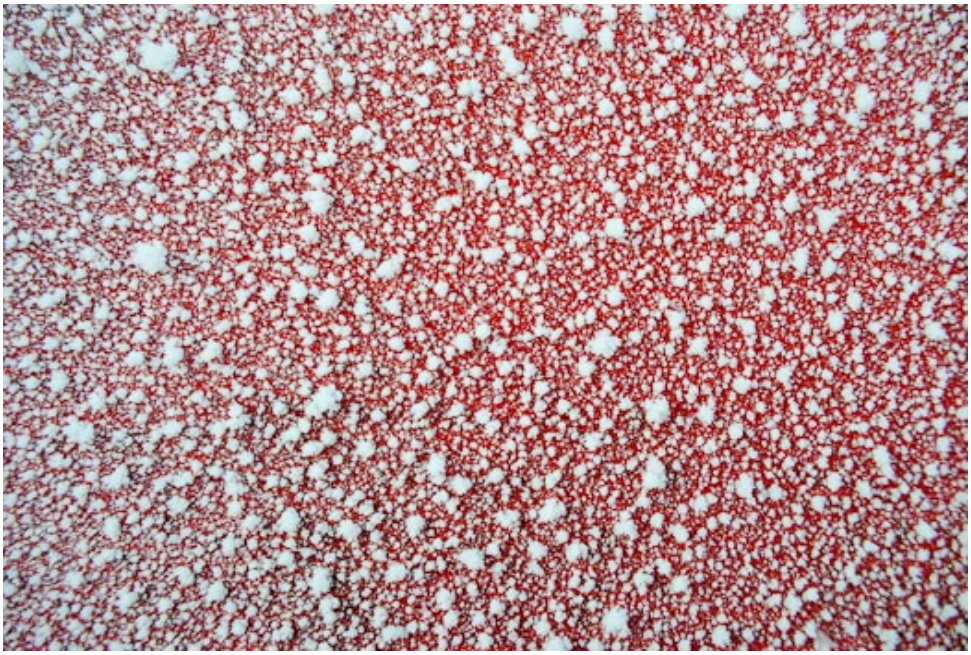
Water is the only substance on earth that naturally occurs as a liquid, a solid, and a gas. Its appearances are many. In liquid form, water appears green of the Caribbean. Vapor, in its varied forms, composes stratospheric clouds, San Franciscan fog, and disorienting desert mirages.

Yet when it comes to shape shifting, ice is the superlative transformer of the natural world. Ice can exist as huge and dense bergs, or ephemeral manifold shapes, colors, and sizes. But from the smallest frost flower to the most massive glacier, it's all the same substance.

The following images offer a brief summary of ice forms encountered thus far on the *CCGS Louis S. St-Laurent*.

Snow Cover. Looking like the stiff peaks of a meringue pie, these chunks of sea ice accumulated after currents and winds pushed floes together and pieces fell to the ice's surface. Once the piles formed, snow covered all exposed surfaces, giving the pieces a soft, whipped appearance.

Cleaving. Pure, clean, and sleek, a flat, a s through, cracking open like a geode to reve structure allows it to break along linear ridg



Frost Flowers. These tiny ice crystals, known as frost flowers, occur when individual water molecules in the air freeze to each other. The molecules, seeking a lower state of kinetic energy, move from the air to the colder surface of the ice forms. The larger frost flowers in this image are roughly the size of a pea.

Frost. Best known as the nuisance that rec freezing outside, frost is the accumulation surface. When frost buildup occurs at a rap formations begin to differentiate and produ handle covered in frost, which accumulate below -20 degrees Celsius.

Icicles. These stalactites of the aquatic world form in freezing environments when liquid water drips down ice suspended to a surface. Icicles atta
to elements of the natural environment, like these thin spears forming off the underside of a floe. Though they look still and elegant, if a large icic
easily kill a person.

Color. Don’t let the white snow cover deceive you. Sea ice comes in an array of magnificent hues. The color of ice comes from its ability to refract blue hues of sunlight. Color is perhaps the best indicator of ice’s age. Younger pieces are cloudy and white, owing to imperfections like brine content and air channels that cause the ice to reflect white light. Older ice is bright blue in color, owing to its uniform crystal structure that better refracts blue wavelengths of light.

Sastrugis and pattern. Sea ice cover can p
create uniform shapes. These sastrugis, o
horizon. When the ship breaks through the
break into pieces of similar size.

Ridges. When ice on either side of a crack is forced together under compressive stresses, one sheet will subduct, and one will form a ridge. This ridging pushes large pieces onto the surface of ice sheets that then pile up and form masses that look like Frank Gehry's interpretation of Stonehenge.

Finger rafting. As two thin ice sheets respo
together, they can intersect, interlock, and
finger rafting. The right angles produced by
by sensuous curves and acute, sharp angl

All text and photos property of Alex Kain.

Last updated: October 22, 2014

Copyright ©2007 Woods Hole Oceanographic Institution, All Rights Reserved.
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