

## Changing Arctic Ocean Freshwater Pathways

- Narrator: January 5th, 2012. **Nature** publishes "Changing Arctic Ocean Freshwater Pathways." The following APL-UW video is based on this article.
- Jamie Morison: What's going on in the Arctic Ocean affects global climate.
- Narrator: Applied Physics Laboratory researchers constantly explore the Arctic the 'hard' way – down on the drifting sea ice.
- Morison: In the past, what we've had to do is go out in airplanes and land on the ice, or take a ship. And because of that sea ice, it's very hard to get at an old-fashioned hydrographic station. So there are very few data points.
- Narrator: But now APL-UW oceanographer Jamie Morrison can look down on the Arctic from a dramatic new vantage point: from space. Orbiting GRACE and ICESat satellites generate ultra-precise measurements and offer visibility of areas inaccessible until now.
- Morison: Now we have two satellites working from space. Their great contribution is they look over the whole Arctic Ocean. We use the ICESat laser satellite altimeter. It basically tells us the sea surface height. The beauty of the satellite systems – ICESat to measure sea surface height and GRACE to measure bottom pressure – with those two satellites, we can look at the difference between the weight of the water measured by GRACE and the height of the water column measured by ICESat and figure out the density. And we can relate that to the freshwater content. You can basically estimate the amount of fresh water diluting the seawater from the difference between these two satellite measurements.
- Narrator: Combined with atmospheric factors, the amount of fresh water in the Arctic Ocean and where it circulates add up to a kind of global thermostat.
- Morison: So the big change is this shift in freshwater pathways – specifically Eurasian river water.
- Narrator: Satellite data reveal to Morison a major change in the location of fresh water from Russian rivers emptying into the Arctic.
- Morison: Normally, the Russian river water in the past had kind of run right across the eastern part of the – the European side of the Arctic Ocean and right out into the North Atlantic or Greenland Sea.
- Narrator: A dominant feature of the Arctic Ocean circulation is the transpolar drift that moves ice and water from the Russian side across the North Pole and out through Framm Strait. Another is the Beaufort Gyre – a clockwise circulation of the atmosphere and ice in the Canada Basin. Atmospheric forcing shifted the transpolar drift counterclockwise and drove Russian runoff east to the Canada basin where it was taken on a more complex path that included residence in the Beaufort Gyre.
- Morison: Massive shifts in air and water affecting global climate – detectable, observable, and measurable in their entirety from space by satellite. It opens up a huge window that was closed before. So now we can see what the distribution of fresh water over the whole Arctic Ocean is. We're pretty excited that we're kind of unraveling the mystery of why these freshwater changes are going on.

