IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology
Vol. 3, Issue 4, April 2016

Tracking Greenland Icebergs

K. Suharsha[1], K. Rangahemanth Kumar[2], Dr. P. Venkatesan[3]

UG Scholar, ECE Department, SCSVMV University, Kanchipuram, India[1, 2]

Associate Professor, ECE Department, SCSVMV University Kanchipuram, India[3]

Abstract: We propose in this paper a few information about tracking Greenland icebergs and to avoid accidents for ships and for easy transportation in oceans. An iceberg or ice mountain is a large piece of fresh water ice that has broken off a glacier or an ice shelf and is floating freely in open water, may subsequently become frozen into pack ice (one form of sea ice). As it drifts into shallower waters, it may come into contact with the seabed, a process referred to as seabed gouging by ice. Density of pure ice is about 920 kg/m³, and that of sea water about 1025 kg/m³, typically only one-tenth of the volume of an iceberg is above water (due to Archimedes's Principle). The shape of the underwater portion can be difficult to judge by looking at the portion above the surface. This has led to the expression "tip of the iceberg ", for a problem or difficulty that is only a small manifestation of a larger problem.

Keywords: Icebergs, density, tip of iceberg, Archimedes' principle.

I. INTRODUCTION

Icebergs generally range from 1 to 75 metres (3.3 to 246.1 ft) above sea level and weigh 100,000 to 200,000 metric tons (110,000 to 220,000 short tons). The largest known iceberg in the North Atlantic was 168 metres (551 ft) above sea level, reported by the USCG icebreaker East Wind in 1958, making it the height of a 55-story building. These icebergs originate from the glaciers of western Greenland and may have an interior temperature of −15 to −20 °C (5 to −4 °F).Icebergs are usually confined by winds and currents to move close to the coast. The largest icebergs recorded have been calvedor broken off, from the Ross Ice Shelf of Antarctica. When a piece of iceberg ice melts, it makes a fizzing sound called "Bergie Seltzer". This sound is made when the water-ice interface reaches compressed air bubbles trapped in the ice. As this happens, each bubble bursts, making a 'popping' sound. The bubbles contain air trapped in snow layers very early in the history of the ice that eventually got buried to a given depth (up to several kilometers) and pressurized as it transformed into firm then to glacial ice.

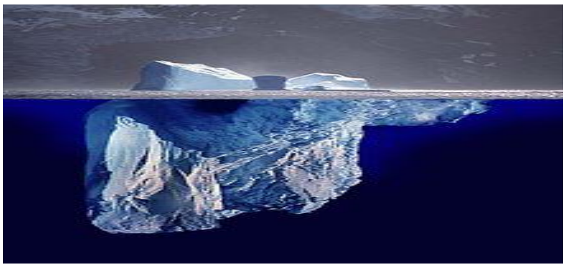

Fig 1 Glacier iceberg

Classification of Icebergs:
In addition to size classification, icebergs can be classified on the basis of their shape. The two basic types of iceberg forms are tabular and non-tabular. Tabular icebergs have steep sides and a flat top, much like a plateau, with a length-to-height ratio of more than 5:1 this type of iceberg, also known as an ice island can be quite large, as in the case of Pobeda Ice Island. Antarctic icebergs formed by breaking off from an ice shelf, such as the Ross Ice Shelf or Filchner-Ronne Ice Shelf, are typically tabular. The largest icebergs in the world are formed this way. Non-tabular icebergs have different shapes and include:

- Dome: An iceberg with a rounded top.
- Pinnacle: An iceberg with one or more spires.
- Wedge: An iceberg with a steep edge on one side and a slope on the opposite side.
- Dry-Dock: An iceberg that has eroded to form a slot or channel.
- Blocky: An iceberg with steep, vertical sides and a flat top. It differs from tabular icebergs in that its shape is more like a block than a flat sheet

New technologies monitor icebergs. Aerial surveillance of the seas in the early 1930s allowed for the development of charter systems that could accurately detail the ocean currents and iceberg locations. In 1945, experiments tested the effectiveness of radar in detecting icebergs. A decade later, oceanographic monitoring outposts were established for the purpose of collecting data; these outposts continue to serve in environmental study. A computer was first installed on a ship for the purpose of oceanographic monitoring in 1964, which allowed for a faster evaluation of data. By the 1970s, icebreaking ships were equipped with automatic transmissions of satellite photographs of ice in Antarctica. Systems for optical satellites had been developed but were still limited by weather conditions. In the 1980s, drifting buoys were used in Antarctic waters for oceanographic and climate research. They are equipped with sensors that measure ocean temperature and currents.

II. TRACKING OF ICEBERGS

Iceberg can easily be seen on satellite images and is nestled within the glacial fjord. But once it gets out to open sea, it will drift and start to break up into smaller pieces, in a way that is virtually impossible to predict. We tracks satellite data for icebergs.

Water currents and the wind are two of the main forces at play in determining where an iceberg goes. Most of the tracking is done by satellites, but as the iceberg breaks up

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology
Vol. 3, Issue 4, April 2016

into smaller and smaller pieces, they become hard to see. Methods to find are:

- Satellite data
- Tracking beacons on the iceberg
- Airplanes with radars

"Icebergs drift and melt until they're eventually impossible to detect by satellite because they are so small," says Eric Rignot, senior research scientist at Nasa's Jet Propulsion Laboratory.

Small icebergs are called bergy bits (around the size of a grand piano) or growlers (about the size of a small house). And anything growler-sized or smaller is tricky for a satellite to pick up. But these small icebergs pose a big threat to ships.

Large icebergs are reasonably visible - it's the smaller pieces that become a problem for shipping, they can be quite hidden by rough seas, and what you can't see is harder to avoid.

One technique to get around this problem is to drop satellite tracking beacons onto the icebergs, which send a signal showing their location, much like a GPS system. They are positioned either by landing on the iceberg in a helicopter, or by dropping the beacon - attached to its own mini-parachute - from an airplane. But there are logistical problems: "The batteries only last around one year, and then you need to replace them.

It is not just ships that are threatened by icebergs - off-shore oil platforms are also at risk, and at one stage, part of the 2010 iceberg looked like it was heading towards one. Ships have the advantage that they can move out of the way. Though an oil rig can move, it is not something that be activated quickly, and is seen as a last resort

Glaciers might move slowly, but they have their dramatic moments. Scientists tracking glacial earthquakes in Greenland have managed to crack open the mysterious dynamics of calving icebergs.

The results, published in the journal Science, could help scientists track the loss of the Greenland Ice Sheet, which is shrinking even faster than Antarctica.

Glacial earthquakes are caused by the calving of glacier ice – when a massive shard cracks like a gunshot and sloughs off the frozen wall.

Breathtaking as these events are, they're caused by very different dynamics than your standard earthquakes, which occur suddenly after stresses building in the ground finally release. Glacial earthquakes, by contrast, can take minutes to play out, and do so gradually (and often almost imperceptibly).

"You cannot feel it," said study co-author Meredith Nettles, a seismologist at Columbia University's Lamont-Doherty Earth Observatory. Nettles and colleagues first discovered glacial earthquakes in 2003, and has experienced a few of these icy temblors in person.

The dataset contains positions reported from 10 large, deep-keeled icebergs tracked near Sermilik Fjord, Southeast Greenland. The icebergs were tracked by deploying GPS units by helicopter on their surface. 5 iceberg tracker units were deployed in summer 2012 and 5 more in summer 2013. Here we list those positions (latitude and longitude) and time of all these icebergs. The GPS units use the Globarstar network to report positions, with horizontal accuracies ~20 m and no vertical information. Nominal reporting interval was set to 1 hour, though intermittent gaps are common.

Fig 2 Scientists used GPS monitors to observe glacial earthquakes, which could help them track the loss

III. TECHNOLOGY USED TO REMOVE ICEBERGS

Before the early 1910s there was no system in place to track icebergs to guard ships against collisions. The April 1912 sinking of the RMS Titanic, which caused the deaths of 1,517 of its 2,223 passengers, also created the demand for a system to observe icebergs. For the remainder of the ice season of that year, the United States Navy patrolled the waters and monitored ice flow. In November 1913, the International Conference on the Safety of Life at Sea met in London to devise a more permanent system of observing icebergs. Within three months the participating maritime nations had formed the International Ice Patrol (IIP). The goal of the IIP was to collect data on meteorology and oceanography to measure currents, ice-flow, ocean temperature, and salinity levels. They published their first records in 1921, which allowed for a year-by-year comparison of iceberg movement.

New technologies monitor icebergs. Aerial surveillance of the seas in the early 1930s allowed for the development of charter systems that could accurately detail the ocean currents and iceberg locations. In 1945, experiments tested the effectiveness of radar in detecting icebergs. A decade later, oceanographic monitoring outposts were established for the purpose of collecting data; these outposts continue to serve in environmental study. A computer was first installed on a ship for the purpose of oceanographic monitoring in 1964, which allowed for a faster evaluation of data. By the 1970s, icebreaking ships were equipped with automatic transmissions of satellite photographs of ice in Antarctica. Systems for optical satellites had been developed but were still limited by weather conditions. In the 1980s, drifting buoys were used in Antarctic waters for oceanographic and climate research. They are equipped with sensors that measure ocean temperature and currents. An iceberg being pushed by three U.S. Navy ships in McMurdo Sound, Antarctica

Side looking airborne radar (SLAR) made it possible to acquire images regardless of weather conditions. On November 4, 1995, Canada launched RADARSAT-1. Developed by the Canadian Space Agency, it provides images of Earth for scientific and commercial purposes. This system was the first to use synthetic aperture radar

(SAR), which sends microwave energy to the ocean surface and records the reflections to track icebergs. The European Space Agency launched ENVISAT (an observation satellite that orbits the Earth's poles) on March 1, 2002. ENVISAT employs advanced synthetic aperture radar (ASAR) technology, which can detect changes in surface height accurately. The Canadian Space Agency launched RADARSAT-2 in December 2007, which uses SAR and multi-polarization modes and follows the same orbit path as RADARSAT-1.

IV. CONCLUSION

Therefore I conclude that there is necessity for the icebergs to be tracked to avoid accidents for ships and for easy transportation in oceans. These icebergs are mainly found in arctic countries. Researchers have been made to reduce these accidents because of icebergs, shipboard radar, satellite photos, global positioning systems(GPS) and aircraft patrols have made the North Atlantic safer now . However, despite improvements in detection methods and more accurate ship position, as well as trending warmer seas melting the icebergs faster, ships continue to have close encounters with these frozen, floating objects.

REFERENCES

[1] Alley, R.B. and D.R. Mac Ayeal, 1994: Ice-rafted debris associated with binge-purge oscillations of the Laurentide Ice Sheet. Paleoceanography, 9, 503-511.
[2] Andrews, J.T., 1985: Grain-size characteristics of Quaternary sediments, Baffin Island region. In:Quaternary Environments: Eastern Canadian Arctic, Baffin Bay, and Western Greenland.
[3] Andrews, J.T., ed.,Boston, Allen and Unwin, 125-153.
[4] Andrews, J.T. and C.L. Matsch, 1983: Glacial marine sediments and sedimentation: An amzotated bibliography .Norwich, UK, Geo Abstracts Ltd., 227 pp.
[5] Andrews, J.T., L.M. Smith, R. Preston, T. Cooper and A.E. Jennings, 1997: Spatial and temporal patterns of iceberg rafting debris (IRD) along the East Greenland margin, approximately. 68°N, over the last 14 ka. Journal of Quaternary Science, 12,1-13.
[6] Andrews, J.T., 1998: Abrupt changes (Heinrich events)in late Quaternary North Atlantic marine environments: a history and review of data and concepts. Journal of Quaternary Science, 13, 3-16.
[7] Bond, G.C. and R. Lotti, 1995: Iceberg discharges into the North Atlantic on millennial time Scales During the Last Glaciation. Science, 267, 1005-1009.
[8] Boulton, G.S., 1972: The role of thermal regime in glacial sedimentation. Inst. Br. Geogr. Special Publ., Special Publication No. 4, 1-19.
[9] Bramlette, M.N. and W.H. Bradley, 1940: Geology and biology of north Atlantic deep-sea cores between Newfoundland and Ireland. Part I. Lithology and geological interpretations. United States GeologicalSurvey, Professional Paper, 196-A, 1-34.
[10] Broecker, W.S., 1994: Massive iceberg discharges as triggers for global climate change. Nature, 372, 421-424.
[11] Broecker, W.S., G. Bond, J. McManus, M. Klas and E.Clark, 1992: Origin of the Northern Atlantic's Heinrich events. Climatic Dynamics, 6, 265-273. [12]Clarke, G.K.C., S.J. Marshall, C. Hillaire-Marcel, G.Bilodaeu and C. Veiga-Pires, 1999: A glaciological perspective on Heinrich events. In: Mechanisms of Global Climate Change at Millennial Time Scales. P.U.Clark, R.S. Webb and L. Keigwin, L. D., eds., Washington, DC, American Geophysical Union, 243-262.
[13] Dowdeswell, J.A., 1986: The Distribution and Character of Sediments in a Tidewater Glacier, Southern BaffinIsland, N.W.T., Canada. Arctic and Alpine Research, 18,45-46.
[14] Dowdeswell, J.A. and T. Murray, 1990: Modelling ratesof sedimentation from icebergs. In: GlacimarineEnvironments: Processes and Sediments. J.A.Dowdeswell and J.D. Scourse, eds., Geology Society Special Publication, 121-137.
[15] Dowdeswell, J.A., M.A. Maslin, J.T. Andrews and I.N. McCave, 1995: Iceberg production, debris rafting, the extent and thickness of Heinrich layers (H-l, H-2) in North Atlantic sediments. Geology, 23, 301-304.