The benefits of the gulf stream

Introduction

The Gulf Stream is considered as a warm, powerful, and swift Atlantic ocean current that originates at the tip of Florida. It follows the eastern coastlines of the Newfoundland and the United States before crossing the Atlantic Ocean

The western intensification makes the Gulf Stream tend to northward, the matter resulting in accelerating current off the east coast of North America. At nearly 40°0′N 30°0′W / 40°N 30°W / 40; -30, the gulf stream splits into two , namely the northern stream crosses to northern Europe and the southern stream which circulates off West Africa. The west coast of Europe and the east coast of North America from Florida to Newfoundland is influenced by the Gulf Stream. In spite of the recent debate arose on the part of many experts , there is consensus that the climate of Western Europe and Northern Europe is consider as warmer than it would be as a result of the North Atlantic drift which is considered as a branch from the tail of the Gulf Stream. It is considered as a part of the North Atlantic Gyre. Its presence resulted in the development of various strong cyclones, both within the ocean and within the atmosphere. The Gulf Stream is also known as a significant potential source of renewable power generation.

History

Europeans discovered the Gulf Stream in 1513 due to the expedition of Juan Ponce de León. After that time, it became widely used by Spanish ships that sail from the Caribbean to Spain. Conducted in April 22nd 1513, the summary of Ponce de León’s voyage log, noted, “ A current such that, although they had great wind, they could not proceed forward, but backward

and it seems that they were proceeding well; at the end it was known that the current was more powerful than the wind. Peter Martyr d'Anghiera and Sir Humphrey Gilbert also became known of its existence at that time.

Benjamin Franklin, deputy postmaster of the British American colonies, interested in the North Atlantic Ocean circulation patterns. While in England in 1768, , Franklin has come to know curious complaint filed by the Colonial Board of Customs in a form of a question : why did it take British packets many weeks longer to reach New York from England than it took an average American merchant ship to reach Newport, Rhode Island, in spite of the merchant ships leaving from London and having to sail down the River Thames and then the length of the English Channel before they sailed across the Atlantic, while the packets left from Falmouth in Cornwall?

Having heard this question, Franklin asked his cousin Timothy Folger, a Nantucket whaling captain to answer this question. Folger pointed out that the merchant ships crossed routinely the then-unnamed Gulf Streamwhich can identified by measurement of the water's temperature, whale behavior , changes in the water's color and the speed of bubbles on its surface while the mail packet captains ran against it. Franklin started to work hard with Folger as well as other experienced ship captains. He learned enough from the Gulf Stream chart and gave it the name for which it is still known up to date. He provided this information to the secretary of the British Post Office, Anthony Todd. However this information was ignored by British sea captains.

In 1770, Franklin's Gulf Stream chart was published in England, where it was mostly ignored. In 1778, Subsequent versions were printed in France. in

1786, versions were printed and published in U. S. the British remained many years ignoring following the advice given by Franklin on navigating the current but when they followed it , they managed to gain two weeks in sailing time.

Properties

The Gulf Stream proper is defined as a western-intensified current which is driven by the wind stress. On the contrary, The North Atlantic Drift is largely thermohaline circulation driven. The Gulf Stream makes Western Europe (especially Northern Europe) warmer than it otherwise would be through carrying warm water northeast across the Atlantic. However, there is a dispute around the extent of its contribution to the actual temperature difference between Europe and North America. Few scientists are in the opinion that this temperature difference resulted from the Atlantic Ocean being upwind of Western Europe (producing an oceanic climate) and a landmass being upwind of the east coast of North America.

(Seager, Richard (July-August, 2006). “ The Source of Europe’s Mild Climate”. American Scientist Online. http://www. americanscientist. org/issues/feature/2006/4/the-source-of-europes-mild-climate. Retrieved 2008-09-23.)

Formation and behavior

In the matter of fact Evolution of the Gulf Stream toward the west of the British Isles continues as the North Atlantic Current. The Atlantic North Equatorial Current, which is considered as a river of sea water, flows westward the coast of northern Africa. The current goes into two branches especially when the current interacts with the northeastern coast of South

America. One of these two branches passes into the Caribbean Sea, while the second branch passes into the Antilles

Current, flows north and east of the West Indies

Once again, these two branches rejoin north of the Straits of Florida, as it is shown on the accompanying map.

In the tropics, the trade winds blow westward. The pattern of this wind this has a stress on the subtropical ocean surface in addition to a negative curl across the north Atlantic ocean.[13] . The resulting Sverdrup transport is considered as equator ward. This transport is balanced by a narrow as a result of conservation of potential vorticity that is caused by the northward-moving winds on the subtropical ridge's western periphery as well as the increased relative vorticity of northward moving water. This, in its turn, resulted in accelerating poleward current, which flows along the western border of the ocean basin. This outweighs the effects the friction has on the western border current which is known as the Labrador Current. The bends along the Gulf Stream are also caused by conservation of potential vorticity . These bends occasionally break off as a result of a shift in the Gulf Stream's position that form separate warm and cold eddies. This process which is known as western intensification makes the currents on the western border of an ocean basin, like the Gulf Stream, stronger than those on the eastern border.

(Maurice L. Schwartz (2005). Encyclopedia of coastal science. Springer, pp. 1037. ISBN 978-1-4020-1903-6. Retrieved on 2009-05-07.)

The Gulf Stream is consequently considered as a strong ocean current. The gulf stream lead to transporting water at a rate of 30 million cubic meters per second (30 sverdrups) through the Florida Straits . This rate rises to reach 150 million(on fifty million) cubic meters per second specially when the Gulf Stream passes south of Newfoundland. The volume of the Gulf Stream affects all the rivers which empty into the Atlantic combined, with nearly total 0. 6 million cubic meters per second. However, this is weaker than the Antarctic Circumpolar Current.

The width of the Gulf Stream is 100kilometers (62mi) and the depth of the Gulf Stream is ranged from 800meters (2, 600ft) to 1, 200meters (3, 900ft). It is known that the current velocity is fastest near the surface, since maximum speed reaches nearly 2. 5meters per second (5. 6mph). When the Gulf Stream travels north, the warm water transported by it undergoes evaporative cooling. The cooling is wind moving over the water cools it and causes evaporation, the matter leaving saltier brine. In this process, the salinity and density of water increases while the water temperature decreases. When sea ice is formed, salts are left out of the ice. This process is known as brine exclusion. These two processes result in producing water which is colder and denser . The water becomes so dense in the North Atlantic Ocean, so that it starts to sink down through less dense and less salty water. (The convective action is not unlike that of a lava lamp.) This downdraft of cold , dense and heavy water becomes a part of the North Atlantic Deep Water, a south going stream.

Localized effects

The Gulf Stream has effects on the climate of the Florida peninsula. Florida coast, which is referred to as the Florida current, keeps an average water temperature estimated at 25°C (77°F) especially during the winter. The east winds passing this warm water result in moving warm air from over the Gulf Stream inland, keeping temperatures milder across the state than elsewhere across the Southeast during the winter. The proximity of Gulf Stream to Nantucket adds to its biodiversity as it is the southern limit for northern plant species and the northern limit for southern varieties of plant life.

(Dr. Sarah Oktay. " Description of Nantucket Island". University of Massachusetts. http://www. umb. edu/nantucket/nantucket/. Retrieved 2009-01-06.)

In addition to the warm air currents, the North Atlantic Current of the Gulf Stream keeps the western coast of Great Britain and Ireland a couple of degrees warmer than the east. On the contrary, the difference is dramatic in the western coastal islands of Scotland. The Gulf Stream and the strong westerly winds (which are driven by the warm water of the Gulf Stream) have noticeable effects on Europe and the Norwegian coast. Next to the Arctic zone, lie the Northern parts of Norway. Most parts of this zone are covered with snow and in winter. However, Norway's coast remains without snow or ice throughout the year. The Gulf Stream warms the weather systems which drift into Northern Europe. These weather systems results in warming the climate behind the Scandinavian mountains.

Effect on cyclone formation

The contrast of warm water and temperature, along the Gulf Stream's edge, often results in increasing the intensity of cyclones or tropical. To generate tropical cyclone normally, water temperatures in excess of 26. 5°C (79. 7°F) is required. Thus, the formation of tropical cyclone is common over the Gulf Stream, particularly in the month of July. Through the Caribbean, the storms travel westward and then move in a northward direction. After that, the storms curve towards the United States' eastern coast or stay on a north-westward track and enter the Gulf of Mexico. These storms have the capability to create strong winds. These winds cause extensive damage to the Southeast Coastal Areas in United States. The Strong extra tropical cyclones were shown to deepen the frontal zone. These tropical cyclones have been forced by the Gulf Stream itself especially during the cold season. The Subtropical cyclones are also being generated near the Gulf Stream. Near the warm water current, nearly 75percent of the systems documented in between 1951 and 2000 are formed with two annual peaks of activity happening during the months of May and October.

Possible renewable power source

In the matter of fact, The Gulf Stream makes on transporting nearly 1. 4 pet watts of heat that is equivalent to 100 times the world energy demand. Many researches have been conducted into different ways to tap this power. There is an idea to supply the equivalent power of several nuclear power plants. This idea is represented in deploying a field of underwater turbines placed 300meters (980ft) under the center of the core of the Gulf Stream, such as being developed by Aquantis, LLC. the thermal energy generated by the

ocean can also be harnessed to produce electricity through using the difference of temperature between cold deep water and warm surface water.

Conclusion

The Gulf Stream, which begins in the Caribbean and ends in the northern North Atlantic, is one of the world’s current systems which have been studied and searched intensively. The extensive western border current plays very important role in transferring heat and salt as well as in causing warm to the European subcontinent. There are many traditional hydrographic studies conducted in this region. These studies include Gulf Stream ’60 (Fuglister 1963) and Iselin (1936). The high degree of mesoscale activity relating to this system has attracted oceanographers. The studies conducted on these phenomena have focused on the “ snapshot” representation of the region.

In the matter of fact, The Gulf Stream transport varies not only in space, but also in time. Kelly and Gille 1990; Zlotnicki 1991; Kelly 1991; Hogg and Johns 1995 assured that the current transports a maximum amount of water in the fall and a minimum in the spring. Rossby and Rago (1985) and Fu et al. (1987) discovered similar results especially when they looked at the differences of sea level across the Stream. These studies also discovered that the Gulf Stream includes marked seasonal variability.