Arctic sea ice at record low due to global warming

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The National Snow and Ice Data Center (NSIDC), a US government-funded research center at the University of Colorado, reported this week the lowest Arctic sea ice extent on record with time still left to go in the summer melting season. Arctic sea ice extent is defined as the area of Arctic Ocean that is covered by at least 15 percent ice.

This week, sea ice extent had shrunk to 4.92 million square kilometers, 400,000 square kilometers less than the previous record set in September of 2005. Arctic sea ice is expected to melt for another month before it reaches an absolute minimum for the year.

Arctic sea ice extent has been in rapid decline since satellite measurements were first available, declining roughly 10 percent every decade since 1979. While it is a cyclical process—ice grows during the winter months and shrinks during the summer months—there is an overall downward trend in the maximum and minimum extent.

According to NSIDC, the rate of melting this summer has been very rapid, declining up to 210,000 square kilometers per day in June and July, a rate unprecedented in the satellite record. Unusually clear sky conditions in June and July contributed a high amount of solar energy, accelerating the melting process.

Warmer temperatures caused by global warming have also been a significant factor. The Arctic has warmed an average of 1 to 2 degrees Celsius since a temperature minimum in the 1960s and 1970s. In addition, warming in the Arctic has occurred more rapidly in recent decades, at a rate of about twice the global average.

Polar sea ice plays an important role in the earth's climate system. Surfaces of the earth covered with snow and ice reflect more solar radiation and thus have a cooling effect. Sea ice reflects between 50 and 70 percent of the solar radiation from the sun, whereas open water reflects only 6 percent. Fresh snow reflects up to 90 percent of the sun's solar radiation.

The reflectivity of a surface is called its 'albedo,' and polar ice participates in what is known as ice-albedo feedback. Under conditions where temperatures are rising, sea ice will melt, exposing the darker open water below. This will cause the earth to absorb more solar radiation that in turn causes temperatures to rise. Under conditions where temperatures are falling, more sea ice will form giving the Earth's surface a higher albedo that in turn will cause greater cooling. Both are examples of positive feedback; in each case polar ice enhances the warming or cooling process.

Many scientists now believe Arctic sea ice will soon reach or has passed a "tipping point," where the sea ice has entered a process of melting that will continue to accelerate until the sea ice will disappear completely. Mark Serreze, a scientist at the NSIDC, told the Associated Press that a complete melting of the summer sea ice could happen by the year 2030. This is much sooner than projected by the United Nation's Intergovernmental Panel on Climate Change (IPCC), which sets the date of disappearance at between 2050 and 2100.

In a report published in May of this year, scientists at the NSIDC and National Center for Atmospheric Research (NCAR) found that the models used by the IPCC are too conservative. The scientists had observed rates of decline more rapid than projected by any of the 18 models used in IPCC's climate report. The scientists speculated that the IPCC models underestimate the effect of global warming caused by carbon dioxide and other greenhouse gases in the atmosphere, and overestimate the thickness of the sea ice.

Scientists at the University of Colorado studying the

formation, transport and melting of Arctic sea ice have done work in estimating the age of the sea ice. Using data from satellites and drifting buoys, they have found that the oldest ice in the Arctic is being replaced by younger, thinner ice more prone to melting. The NSIDC speculates that the transition to younger sea ice began in 1970s, and notes that the older sea ice is essential in maintaining the stability of summer sea ice in the Arctic.

The decline of Arctic sea ice has global implications. In addition to stimulating global warming, the melting of the ice will introduce greater amounts of freshwater in the Arctic Ocean, and will affect the global ocean currents. The removal of the ice cap will also affect the exchange of heat, gases and momentum between the atmosphere and the ocean.

The destruction of the sea ice also means the destruction of habitat for many marine and land animals, as well as increased stress on indigenous populations in the Arctic. Melting sea ice in the spring forms the nutrient-rich environment for phytoplankton blooms. Phytoplankton is fundamental to the marine food web, and is an important carbon dioxide sink and source of oxygen in the atmosphere. Sea ice is also the habitat for polar bears, seals and walruses.

For the major imperial powers claiming territory in the Arctic, the environmental impact of the melting of the Arctic ice is not seen as a cause for concern. Instead, it is seen as great opportunity, with vast untapped oil and gas reserves, and the opening of previously inaccessible shipping routes.

These new figures on sea ice extent, along with other recent scientific reports, show that global warming is occurring more rapidly than previously thought. The significance of the environmental impact, and the danger it poses for the world's population and ecosystem, contrasts sharply with the continued inability of world governments to take any serious action to reverse the trend.