# Arctic As A Broken Part Of The Earth’s Refrigeration System: Opinion Essay

## Introduction

In this short essay, I will briefly describe why I believe the Arctic is indeed a broken part of the Earth’s refrigeration system, discussing the main components of how it cools the Earth and how processes involving these components may be changing to reduce their effectiveness and influence on the Earth’s climate.

## Components: Arctic Sea Ice and Snow

The two main components of the Arctic that are involved in the cooling of the Earth are Arctic Sea Ice and Snow. Since records began in 1979, Arctic sea ice has decreased, in the range of 3.5% to 4.1% per decade (R.K Pachauri et al., 2015). There has also been a decrease in June snow cover, and between 1979 and 2011, June snow cover had decreased by 17.8% per decade (C. Derksen and R. Brown 2012). These components help cool the Earth due to the process known as the Arctic Albedo Effect.

## Arctic Albedo Effect

When applied to planet Earth, an albedo effect is how much solar radiation the Earth reflects back out into space. Arctic sea ice reflects around 80% of sunlight (https://nsidc.org/cryosphere/quickfacts /seaice.html), and snow covered surfaces reflect 90% of light back into space ( T.C. Grenfell, 1994). The Arctic sea ice albedo feedback is one of the main drivers of Arctic climate change (C.W. Thackeray, A. Hall, 2019). As I previously stated, the extent of Arctic sea ice and snow has decreased recently, and has reduced the surface albedo with a trend of -1.6% per decade (H.T Peng et al., 2019). A negative feedback loop has been established whereby the maximum amount of ice is being reduced each year. This has allowed the dark ocean to absorb more solar radiation for longer periods of time, heating the water and the atmosphere and melting even more snow and ice (D.K. Perovich, C. Polashenski, 2012), and reducing the components effectiveness on how the Arctic cools the Earth, leading to this concept of the Arctic being a ‘broken refrigerator’.

## Increased Ocean and Atmospheric Temperatures

As the Arctic albedo effect is less effective, the ocean absorbs more heat, making it and the atmosphere warmer and causing more sea ice to melt. This is known as Arctic Amplification and has resulted in the Arctic warming twice as fast as anywhere else on the planet (Screen and Simmonds, 2010). As the climate is warmer, more snow, sea ice and other vital components such as permafrost melt, which has resulted in significant amounts of Methane to be released into the atmosphere, making it even more warmer (G. Whiteman et al., 2013). Warmer temperatures make it harder for more sea ice to form and has resulted in more precipitation falling as rain (AMAP 2019). Due to the Arctic Albedo Effect being less effective, increased ocean and atmospheric temperatures have changed their influence on the Earth’s climate.

## Influence on the Earth’s climate

An increase in ocean and atmospheric temperatures has had a negative effect on the Earth’s climate and has caused more extreme weather events in lower latitudes, including extreme weather events like Europe’s 2010 heatwave and Florida’s freezing winter of 2010-11 (J.A. Francis and S.J. Vavrus, 2011). This has threatened Europe, as there is a link between the position of the jet stream and the retreat of sea-ice, bringing extreme weather events in the winter and spring, for example Ireland’s winter 2010-11 (Science Daily 2019). This exceptional rate of Arctic Amplification has shrunk the temperature range between north and mid-latitudes (R. Hodgkins, 2019), allowing warmer weather systems to enter the Arctic.

## Conclusion

To conclude, I agree that the Arctic is infact a broken part of the Earth’s refrigeration system, as processes such as the albedo effect are now failing due to less sea ice and snow cover, leading to Arctic Amplification and more weather extremes globally.

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