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Climate Change-A Threat to the World

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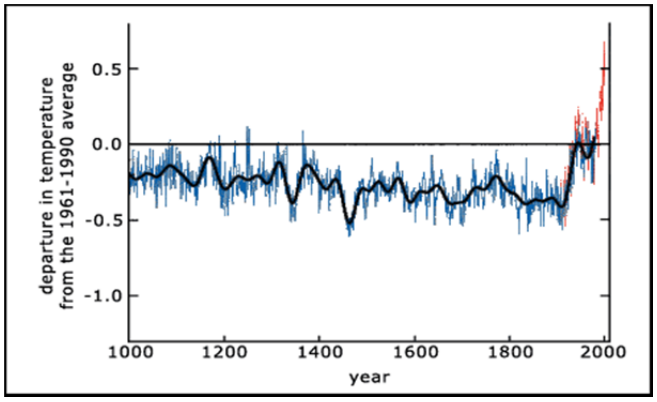
Abstract—*Climate is always changing. We had ice ages and warmer periods. Climate reacts to whatever forces it to change at the time , humans are now the dominant forcing. Three main elements due to this are artic amplification, climate change and global warming. The earth had been warming rapidly since 19th century and artic is warming faster. In the recent years the average temperature hasn't gone up but the amount of heating has increased. By the end of century Artic temperature can rise up to 7-8 degree. Apart from the land, climate change footprints can be seen in deep ocean .*

With global ocean getting warmer and more acidic, the habitat and food webs are changing with them. Oceans had absorbed one-third of the carbon-di-oxide which dissolve in water to form carbonic acid with the pH ranging between alkaline 7.8-8.4 the extra acid has pushed the pH down by 0.1 on average. Also oceans had taken up heat 90% that is trapped by greenhouse gases raising sea level temperature by 0.1 degree every decade. Sea water at 700m had heated up to 0.015C every decade. So, "humans are responsible for all the warming we have experienced since 1950's

1. INTRODUCTION

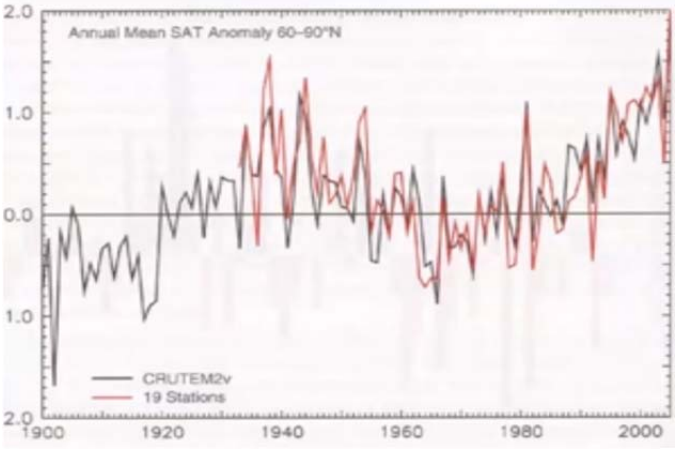
"ARTIC AMPLIFICATION", which is the fact that Artic is warming than any other part of the world. Climate change relates to how fast is warming happening and at what rate and how much fast it is happening in Artic and the impacts of Artic changing on the rest of the world. The earth has been warming rapidly since the mid-19th century.



Temperature change over 1000 years

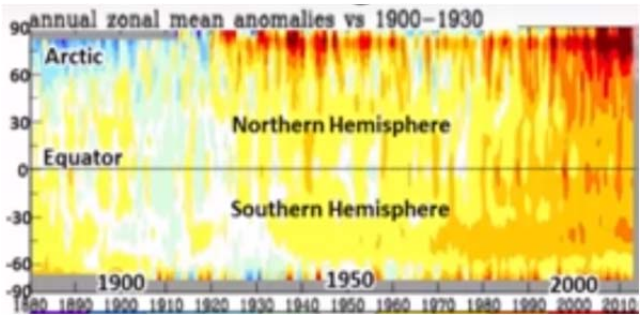
If we look at the curve we will see that artic is warming faster than rest of the world. The climate was gradually getting cooler earlier and we were moving to new ice age. Till mid 19th century, it was a very cold time. Suddenly, climate change happened and it got warmer very rapidly corresponding to industrial revolution, thus putting greenhouse gases in the atmosphere resulting man induced global warming.

During last 150 years, the climate change happened in 2 bursts, a raid warming from late 19th century up till 1940 got back a little and again increased from mid 1960's. Artic climate curve gave the same pattern as the rest of the globe only difference being at a rapid pace. The warming in the artic during period is more than 3 degrees which is different from the world which has warming of 0.8 degree. The heating is concentrated majorly in the western part of the Artic Ocean and gets ice free in the summer.

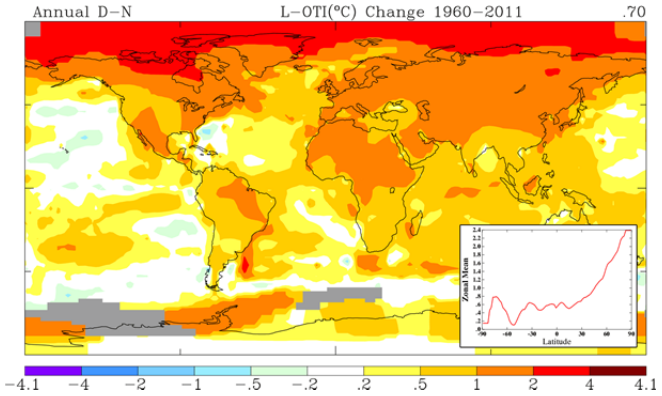


temperature change from 1900's

Presenting the global average surface temperature change as a color change allows us to see that the heating of the biosphere has not stopped – it is sustained at the same large increase. The temperature increase has been same since 2006. This temperature anomaly above the average past normal indicates constant heating. The zonal presentation shows the NH heats up faster than the SH, and the difference increases over time of heating. The artic is heating by far the fastest which is started to affect the normally temperature NH.



Extra heat is going into the earth, but instead of warming air temperature currently all is being absorbed in the ocean and heating up the deep ocean especially the Pacific ocean. 7-8 degrees of warming is expected by the end of century.



Temperature change across globe

This shows trend in mean surface air temperature over the period 1960 to 2011. The red is Artic, indicating that the trend over this 50 years period is for an increase in air temperature of more than 2 degrees (3.6 F) across much of the Artic, which is larger than for other parts of the globe.

2. CLIMATE CHANGE AND GLOBAL WARMING

The two terms are used interchangeably. However, Climate change deals with natural happening changes due to all types of natural courses while global warming to the specific changes happening because of greenhouse gases. The earth has passed through many ice ages. Allowing nature to take its course we will gradually come out of ice age and sink towards next.

However, we are warming up. This natural change is now accompanied by natural change in the carbon-di-oxide content. The natural limits of CO2 lies between 180- 270 ppm. The levels have increased tremendously from 270, currently being over 400 ppm. This is entirely due to burning of coal and oil. This is inadvertent experiment on climate. We have done that and we are continuously doing it. The rate of increase of carbon emissions in atmosphere continues to increase exponentially. However, in Europe and in USA the emissions have gone down recently, but this has happened at the cost of china and India. However, totally emission will overall affect the world as carbon has no national emission will overall affect the world as carbon has no nationality.

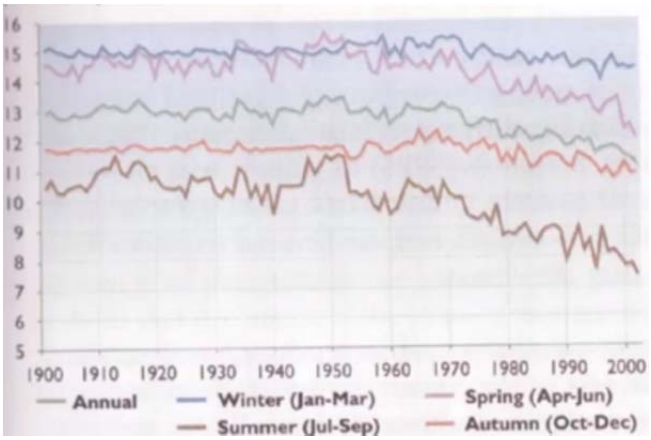
3. IMPACTS OF ARTIC WARMING

There are 7 different types of impact identified.

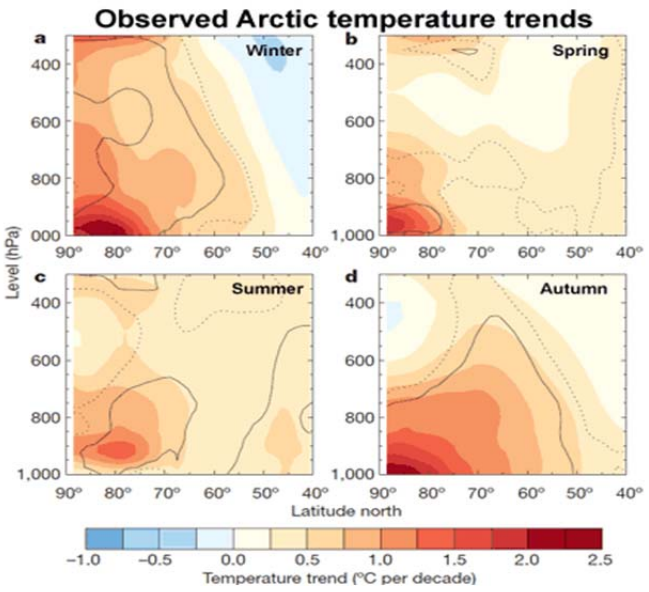
1. Sea ice retreat and albedo effect
2. Acceleration of retreat due to thinning and composition changes
3. Accelerated melt from Greenland ice sheet leading to enhanced rate of global sea level rise.
4. Snowline retreat and enhanced albedo feedback
5. The threat from offshore artic methane
6. Extreme weather and food production
7. Decline in strength of the Atlantic thermohaline circulation

4. SEA ICE RETREAT

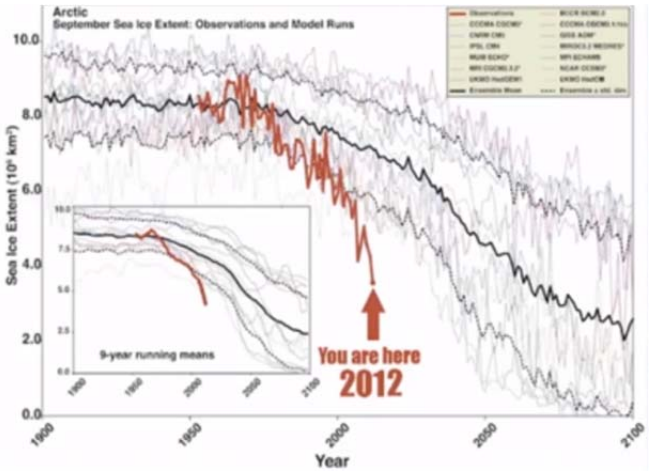
It was first noticed in 1950's. Until 1950's it was difficult to identify an sea ice retreat due to lack of technology. Aerial surveys and satellites added to our knowledge about the sea ice retreat.



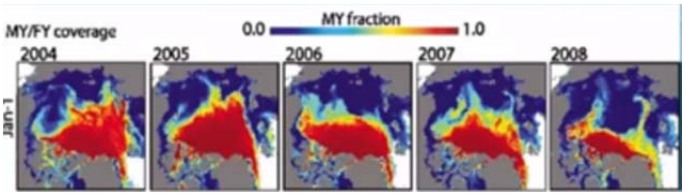
The maximum retreats occur in the summer month (jun-Sep). This is due to ice in artic fills the artic ocean around the coastline of Alaska and Siberia and easy to see retreat in summer because the sea ice falls back from those sea lines. Record minimum ice extent was seen in September 2007 and was even bigger retreat in May, 2012.



observation of temperature trends, 1989-2008. Temperature trends averaged around circles of latitude for winters (December- February, a), spring(March-May, b), summer(June-August, c) and autumn(September- November, d). Red shading indicates that the lower atmosphere has warmed faster than the atmospheric column as whole blue shading indicates that the lower atmosphere has warmed slower than the atmospheric column as a whole.



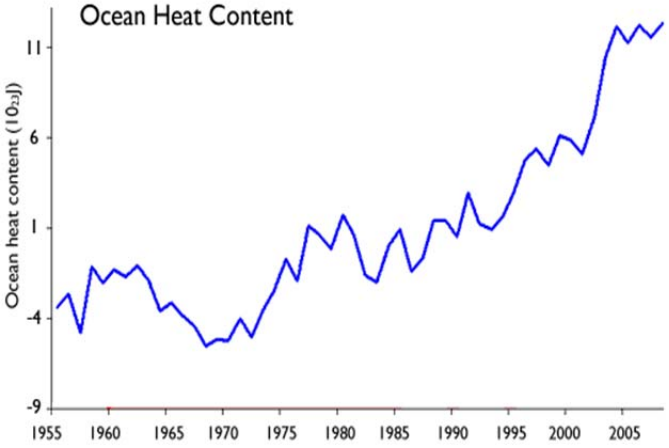
The red shows the happenings of September 2012. A rapid decrease up to 2012 which brought us to here. According to studies, the loss of ice between 1980's and 2011 has a direct link with the global warming explained by Albedo effect. Albedo is the fraction of the solar radiations falling on the surface of the earth that is reflected back into the space because the surface is wide. Moreover ice cover is getting thinner, weaker and more dynamic.



red area is the melting of ice containing maximum portion of ice

5. GLOBAL SEA TEMPERATURE

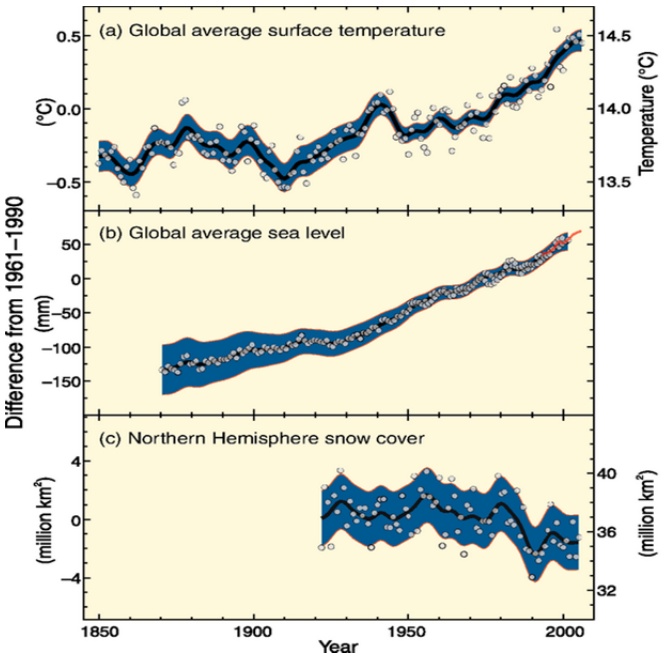
As climate change has warmed the earth, ocean have responded more slowly than Land. Though, researches show that marine ecosystem can be far more sensitive to even the most modest temperature change. Human activities has raised the average global temperature and in ocean this change has been about 0.18 F (0.1 C). This warming has occurred from the surface to a depth of about 700 meter, where most marine life thrives.



Ocean heat content variation over the years

Many organisms are vulnerable to temperature change including corals. Other organisms affected by temperature change include krill, an extremely important link at the base of the food chain. Krill reproduce in smaller numbers when ocean temperature rises. This leads to cascading effect by disrupting the life cycle of krill eaters, such as penguins and seals- which in turn causes food shortage for higher predators.

Warmer sea temperature are also associated with spread of invasive species and marine diseases. Evolution of stable marine habitat is dependent upon myriad factors, including water temperature. If it becomes warmer, it creates an opportunity where bacteria can suddenly thrive where they were once excluded leading to forced migration and even species extinction.



The only way to reduce sea temperature is to dramatically reign in emission of greenhouse gases. However, even if we immediately drop carbon-di-oxide emission to zero, the gases already released would take decades or longer to dissipate.

6. CONCLUSION

Changes in atmospheric water vapour content may amplify Artic warming. However, specific humidity trends are found only during summer and early autumns. The empirical evidence from the past two decades reveals that declining sea ice cover and thickness have been great enough to enhance Artic warming during most of the year. The emergence of strong ice-temperature positive feedback increases the likelihood of future rapid Artic warming and sea ice decline.

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