Report:

Under the Representative Concentration Pathways, RCP2.6 and RCP8 adopted by the IPCC for its 5th assessment report (AR5), this report will explain possible future scenarios for the Arctic sea ice extent.

The Arctic is feeling the effects of global warming more severely than any where else on Earth. Understanding the events that are happening in the Arctic are very important as it will have severe consequences for the rest of the globe.

As the Earth warms, Polar snow and ice melts, which allows the dark oceans to absorb more heat causing the Earth to become warmer, which leads to more snow and ice melt. When water heats up, it expands which causes the sea to rise. This is called an Amplifying Feedback.

As the temperature increases, the amount of energy given off by an object goes up to the 4th power. The hotter the object, the more energy it gives off.

The extra energy that the Earth is receiving at present is about 1.6 watts per meter square of it's surface. When multiplied by the surface area of the Earth, it is 800 trillion watts per year. This extra energy is being added to the Earth.

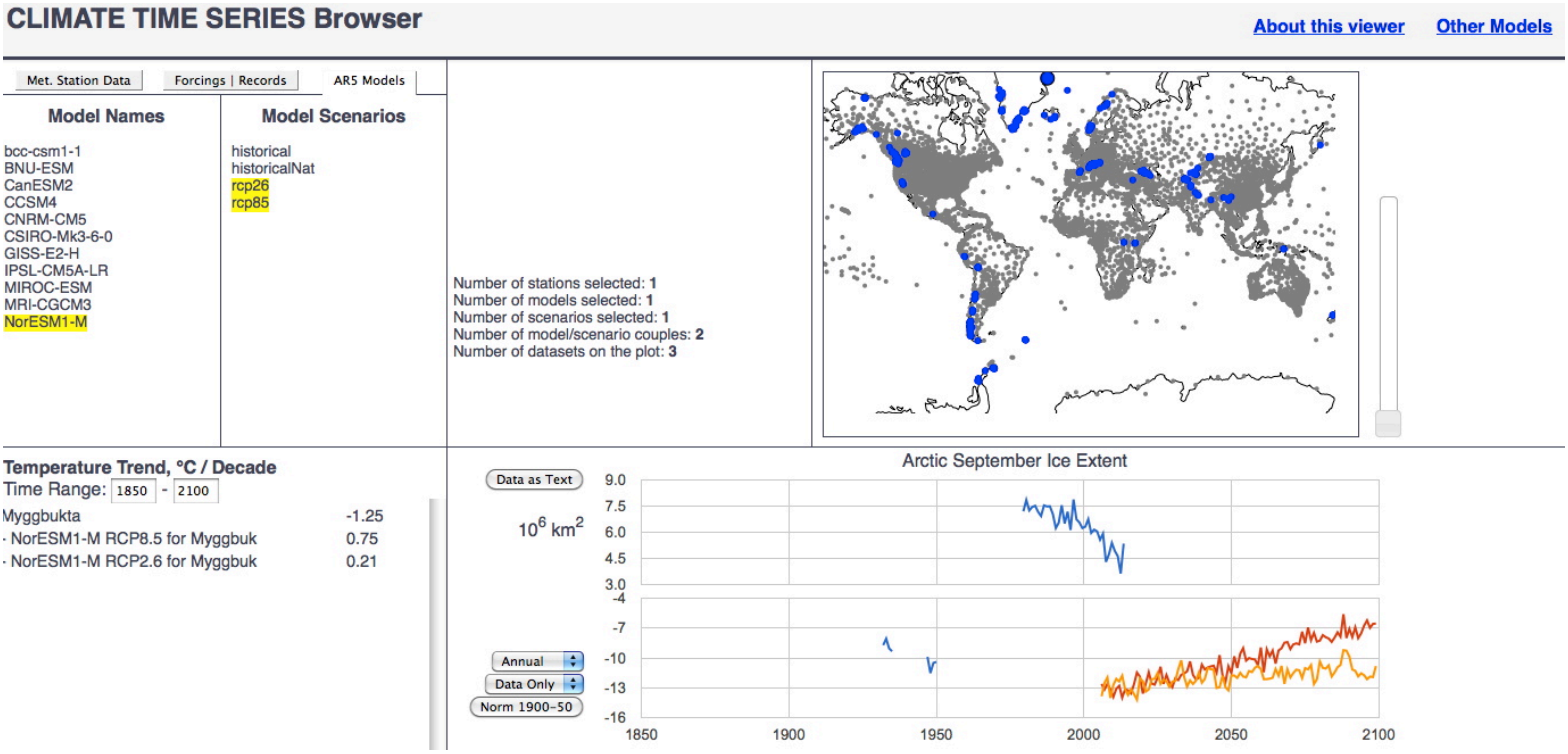
The planet is out of balance, with inflow exceeding outflow. Earth's temperature will continue to rise until the inflow and outflow are back in balance.

The Arctic is losing about 30,000 square miles of ice a year.

Since 1980 the Arctic has lost 40% of its sea ice cover.

Under the RCP2.6 scenario which is aiming to limit the increase of global mean temperature to 2*ºC*. You will see from figure (1) that because the global temperature has not risen above 2*ºC*, the sea ice melt has leveled off. You can see a nice stable yellow line from the year 2000 up to 2100.

The blue line from around 1960 to 2013, represents our previous and current trend.



(Figure 1)

Using data from the worst case scenario of RCP8, that is if we do not reduce our CO2 emissions and continue emitting the same amount or more. You can see from the red line, the rate of ice melt is dramatic with a very large spike continuing upwards for many years.

Under the RCP8 scenario, the rising trend affects most parts of the world.

The rate of ice loss varied throughout the summer of 2012 and 2013. September sea ice extent for 2013 was the 6th lowest on record.

Contrasting weather patterns played an important role in the gain of sea ice in 2013. We had a much lower than average pressure over the Arctic and a higher than average pressure over Greenland, this caused a wind pattern that helped in ice movement across the ocean.

The quality of the station data could have been more detailed. For example, it takes energy to melt ice. The energy required to melt the 16,400 Km^3 of ice that is lost every year from April to September is about 5 x 10^{21} Joules.

Being able to measure the ice thickness and thinness would have provided interesting data. The Arctic has thinner ice now than it ever has, therefore the model I used would have still showed that the Arctic had ice cover, but not how thin or thick or was. The thin Arctic ice tends to be slushy, and it melts faster. Therefore, if the thickness of sea ice goes down, it's probable that the summer ice will go down too. Which results in faster sea ice melting.

References:

Frederic W. Taylor (Sep 28 2005) *Elementary Climate Physics*

http://www.theguardian.com/environment/climate-consensus-97-per-cent/2013/sep/19/climate-change-arctic-ice-sixth-lowest-in-millennia