16 June 2016 | Alex West, Ann Keen and Ed Blockley

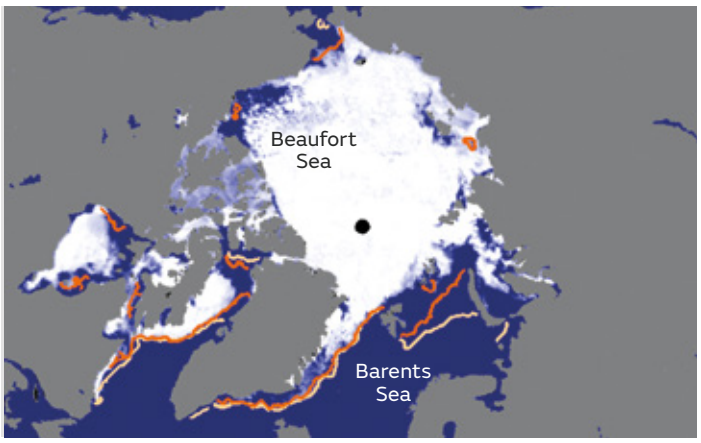
Briefing on the state of the Arctic sea ice

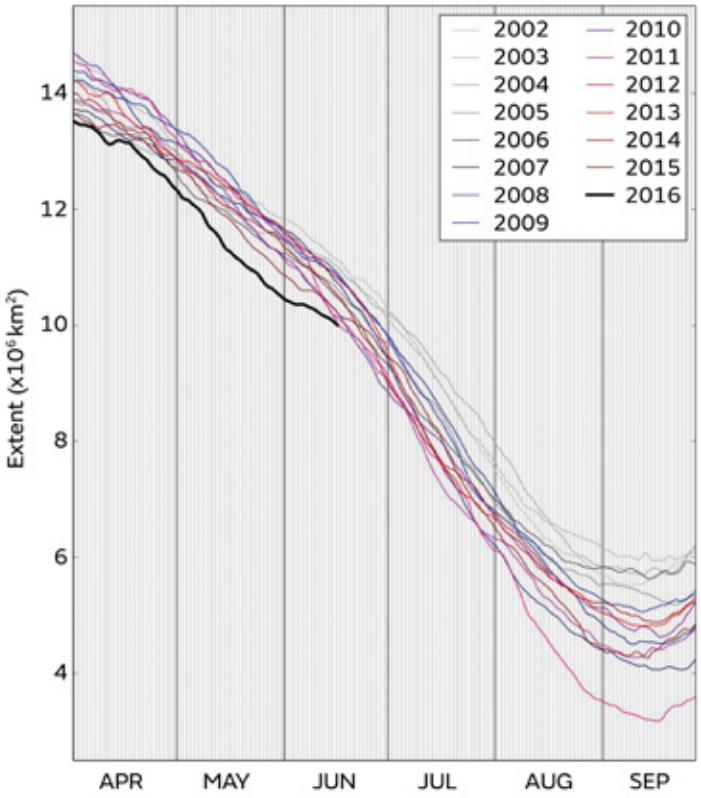
Current Arctic sea ice extent

Arctic sea ice extent on 15th June 2016 was 9.99 million square km (Figure 1), according to data from the Japanese Aerospace Exploration Agency (JAXA)* . This is the lowest recorded for the time of year since the start of the JAXA record in 2002.

Extent is 0.54 million square km below the 2006-2015 average for this date and 0.14 million square km below the previous record low for the time of year, which occurred in 2012. Extent is currently particularly low in the Beaufort Sea north of Alaska, and the Barents Sea north of Norway (Figure 2).

The conditions are likely to be associated with persistently above-average air temperatures during the spring, and frequent southerly winds in the Beaufort Sea causing ice to be blown away from the coast.





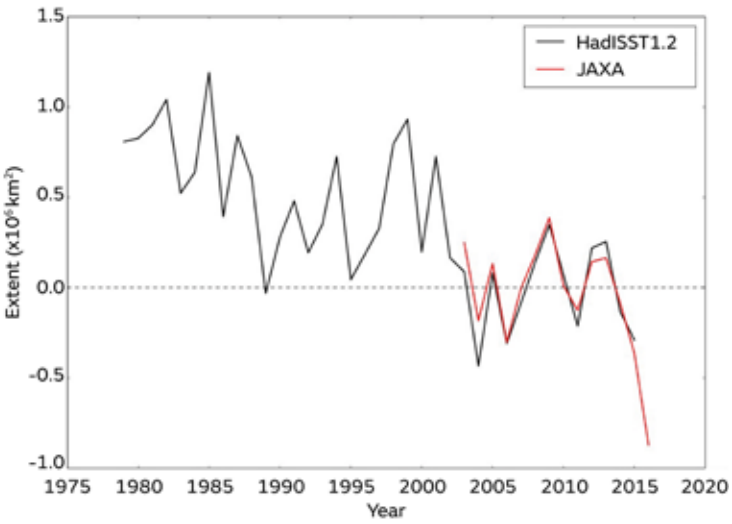
▲ **Figure 1:** Daily Arctic sea ice extent for 2016, compared with recent years. Data is from the Japanese Aerospace Exploration Agency (JAXA), derived from the AMSR-E and AMSR2 sensors.

◀ **Figure 2:** Sea ice extent on 15th June 2016 from the AMSR2 sensor , with average 1980s (peach) and 2000s (orange) extent for this date overlain, derived from other satellite sensors. Underlying map and data courtesy of Japanese Aerospace Exploration Agency

May 2016 in context

The average May Arctic sea ice extent was 11.28 million square km. This is 0.87 million square km below the 2006-2015 average (Figure 3).

The average rate of ice extent loss for May was 59,000 square km per day, the second fastest since the start of the JAXA record in 2002 and above the 2006-2015 average of 52,000 square km per day.



▲ **Figure 3:** May average Arctic sea ice extent anomaly (difference from the 2006-2015 average for the month) with units in millions of square kilometres.

Arctic winter 2015-16

Arctic maximum extent this year was 14.52 million square km which occurred on 24th March 2016. This was the lowest maximum extent on record, although only slightly lower than last year's record low of 14.54 million square km on 25th February 2015.

The winter was exceptionally mild in the central Arctic; according to the National Center for Environmental Prediction (NCEP) reanalysis, the average surface temperature from November-March north of 70°N latitude was the highest on record by a margin of around 2 degrees over the previous highest (winter 2013-2014).

Estimates of Arctic sea ice volume from the University of Washington, derived from the PIOMAS forced ice-ocean model, suggest that ice growth has been significantly lower than average during the winter. Measurements of sea ice thickness from the CryoSat-2 satellite suggest that large areas of the Arctic Ocean contained sea ice thinner than 2m during April (a thickness below which sea ice is usually considered vulnerable to melting away during the summer). However, ice around the North Pole (an area which generally does not melt out during the summer at the moment) is likely to have been thicker than at the same point in 2015 (Figure 4).

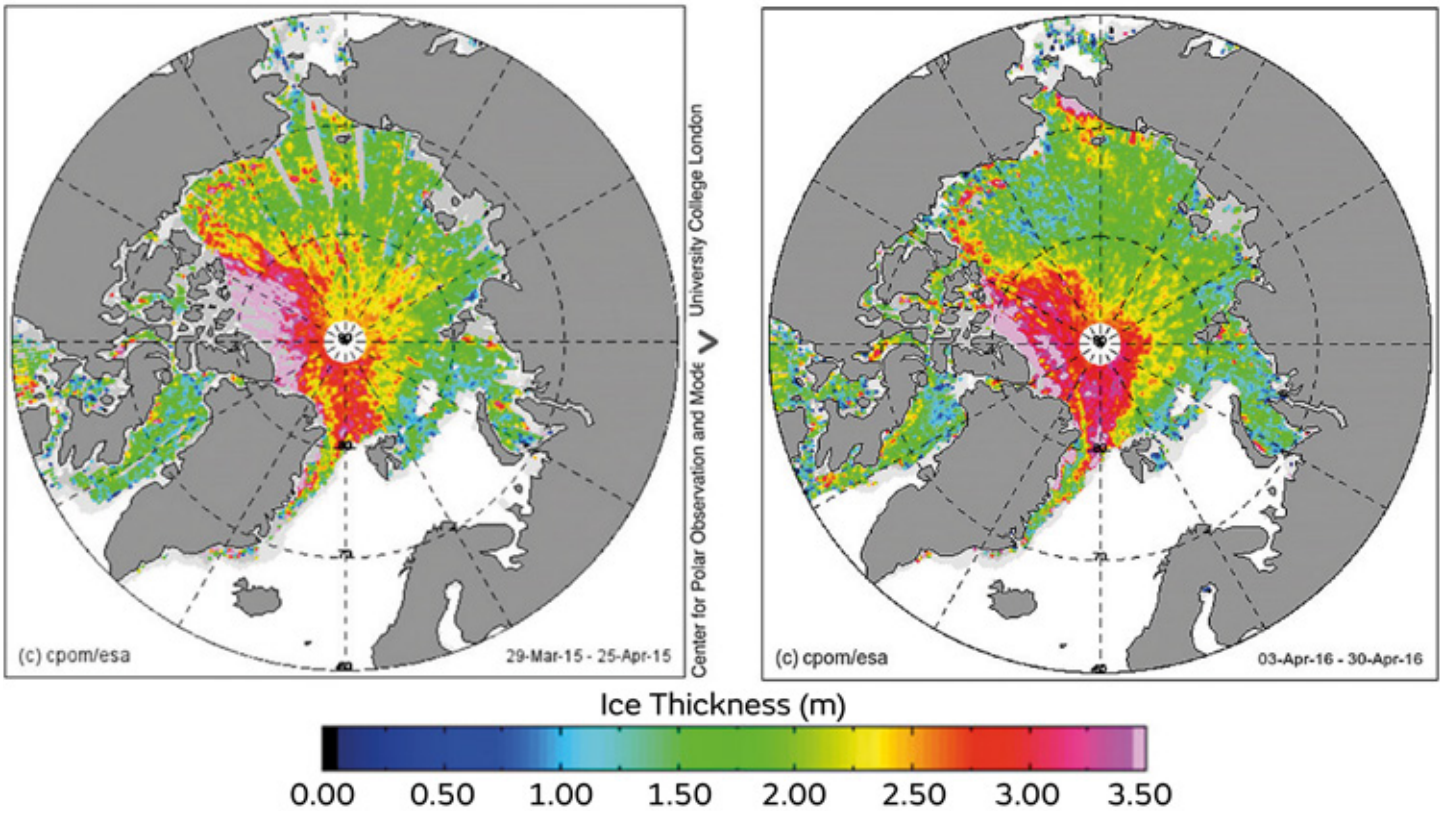


Figure 4: April mean Arctic sea ice thickness for (left) 2015; (right) 2016, as estimated from radar altimetry data from CryoSat-2. Courtesy of Centre for Polar Observation and Modelling.

Outlook for 2016 melt season

While there is no significant correlation between ice extent in mid-June and the seasonal minimum extent in September, this year the extent has remained at a record low level for an unusually long period, although the rate of loss has slowed in the past week. This, combined with the relatively thin ice observed at the start of the melt season, means the ice will be especially vulnerable to melt this year. However the eventual seasonal minimum will be strongly influenced by the weather conditions over the Arctic for the remainder of the melt season.

* Note that the source used for real-time daily sea ice extent data, JAXA, is different to the sources that have been used in the past for these briefings, the National Snow and Ice Data Center (NSIDC) and the HadISST1.2 datasets, which have temporarily suspended production of their data due to the failure of a satellite sensor. JAXA sea ice extent data from the AMSR-E and AMSR2 sensors extends only back to the year 2002, hence the relatively short climatology (2006-2015) used for comparison purposes here.