

HEAT

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Arctic's Winter Sea Ice Drops to Its Lowest Recorded Level



A research plane surveying ice thickness in the Arctic in August.

INTRODUCTION: The arctic is 23 to 35 degrees warmer in summer as the article states. As a result more ice is Melted in the summer. 470,000 mi.² less ice as measured by National Snow and ice data center in Boulder Colorado.

QUESTIONS: (a) Convert 470,000 mi.² to m.² ?
(b) Take the ice to be 1 meter thick, find the volume (in m.³) of 470,000 mi.² of ice 1 meter thick?
(c) Find the mass (in kg.) of this 470,000 mi.² of less ice (1 meter thick)?, (d) Find the heat(Q) needed to melt this 470,000 mi.² of ice 1 meter thick?

HINTS: 1610 m. = 1 mile , ρ_{ICE} (density of ice)= 916.7 kg./m.³ , L_{FUSION} (latent heat of fusion of ice) = 334 KJ/kg. , $L_{\text{ICE}} = Q/m$, Thus, $Q = L_{\text{ICE}} m$,

ANSWERS: (a) 1.218×10^{12} m.² , (b) 2.4366×10^{12} m.³
(c) 2.233×10^{15} kg. , (d) 745.822×10^{15} KJ

COMMENT: With warmer air (20 – 30 F degrees warmer) above the arctic ice in summer it is very possible to melt this large quantity of sea ice.

Much of the **ice in the region appears to be thinner than normal.** After a season that saw temperatures soar at the North Pole, the Arctic has less sea ice at winter's end than ever before in nearly four decades of satellite measurements. The extent of ice cover — a record low for the third straight year — is another indicator of the effects of [global warming](#) on the Arctic, a region that is among the hardest hit by climate change, scientists said. “This is just another exclamation point on the overall loss of Arctic sea ice coverage that we’ve been seeing,” said Mark Serreze, the director of the [National Snow and Ice Data Center](#), a government-backed research agency in Boulder, Colo. “We’re heading for summers with no sea ice coverage at all.” Dr. Serreze said that such a situation, which would leave nothing but open ocean in summer until fall freeze-up begins, could occur by 2030, although many scientists say it may not happen for a decade or two after that.

Less ice coverage also means that there is more dark ocean to absorb more of the sun's energy, which leads to more warming and melting in a feedback loop called Arctic amplification. The data center said on Wednesday that sea ice in the Arctic had reached maximum extent, of about 5.5 million square miles, on March 7. That is an area nearly twice the size of Australia, but about **470,000 square miles less than the average maximum** from 1981 to 2010. Much of the ice also appears to be thinner than normal, Dr. Serreze said, another result of the unusually warm temperatures in the Arctic this winter. **Late last fall, parts of the Arctic were more than 35 degrees Fahrenheit warmer than observed averages, and at the pole itself, mean temperatures for November were 23 degrees above normal.** Less coverage and thinner ice mean that this summer's minimum, which is expected to occur in September, is likely to be low. Dr. Meier said that in addition to the low overall ice extent, some parts of the Arctic were almost completely devoid of ice this winter, including the Barents Sea off Norway and Russia. “We haven’t seen much there at all,” he said, “and what there is will melt very quickly.”