

BRIEF ANALYSIS

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Climate Forecast: Warm and Sunny

by Dennis T. Avery

Only in the past 20 years have scientists begun to understand that the Earth has a moderate, persistent 1,500-year climate cycle that creates warmer and cooler periods of time. Sunspot records and the isotopes of carbon, oxygen and beryllium trapped in ice cores and cave stalagmites indicate that this process is driven by a small cycle in the sun's radiance.

The Earth's climate is more stable during warm periods. The warming heats the polar regions more than the equatorial regions, reducing temperature differences and thus reducing the power of storms. For instance, Chinese court records indicate far fewer

floods and droughts during the Roman Warming of the first century and the Medieval Warming of the 12th century than during the intervening cold Dark Ages and the recent Little Ice Age.

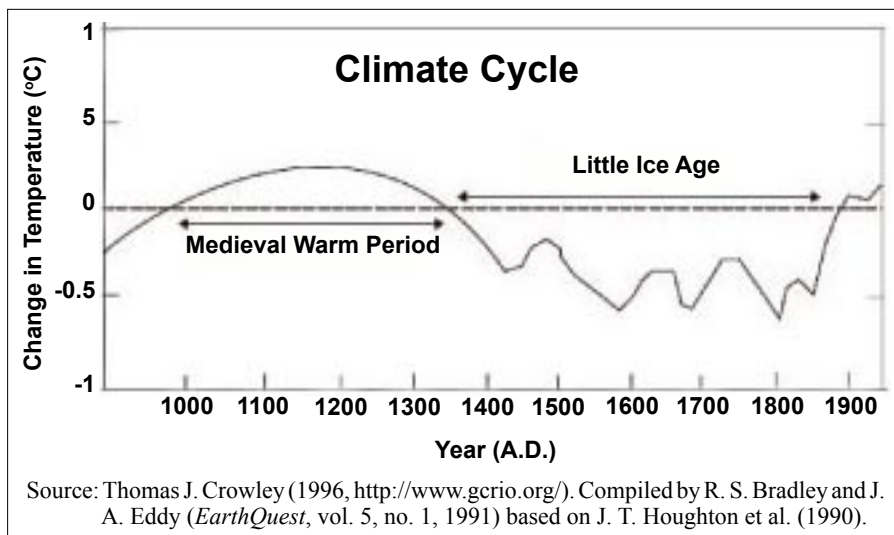
At the latitudes of New York and Paris, temperatures during the warm periods rise about 2° C above the mean for 500 to 750 years. Then they fall abruptly about 2 degrees below the mean for a similar period. Thus, the Earth's climate is always warming or cooling.

Climate History: Hot and Cold. Scientists first noted that the Roman and Medieval warmings were part of a much longer pattern when Greenland ice cores, first brought up in 1984, provided 250,000 years of climate

history. Evidence of the 1,500-year climate cycle has since been found in Antarctic glaciers, in the seabed sediments of four oceans, in ancient tree rings, and in cave stalagmites on all the continents and New Zealand. But 1,500-year cycles were too long and too moderate for ancient peoples without thermometers and written records to discern.

In Europe, the Roman Warming lasted from 200 B.C. to A.D. 600. It allowed grapes and olives to be grown farther north, and good rains allowed the Romans to buy abundant grain from across the Mediterranean in

North Africa. The Roman Warming was followed by the cold Dark Ages (A.D. 600 to 950). Weather is far less stable during the cold phases of the climate cycle. Widespread droughts and storms drove hordes of hungry barbarians to assault the granaries



of the collapsing Roman Empire.

The Medieval Warming prevailed from about A.D. 950 to 1300, bringing ample sunshine, milder storms and longer growing seasons. Food harvests were so good that Britain's population rose from an estimated 1.4 million people in the late 11th century to 5 million in 1300. Europe's total population increased from 40 million to 60 million — during a period when temperatures rose higher than today's.

From 1300 to 1850, the planet shifted into the Little Ice Age. The good weather ended abruptly. During the summer of 1315, incessant sheets of rain fell from May to August throughout Europe, washing away much of

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the topsoil and beating crops to the ground. In late summer, the weather turned unseasonably cold, and the soft kernels of the few surviving grain plants were attacked by fungus. Across northern Europe, harvests were disastrous, and famine set in.

“The cries that were heard from the poor would move a stone, as they lay in the street with woe and great complaint, swollen with hunger,” wrote a Flemish observer. Millions died. There were rumors of cannibalism. The farmers’ draft animals starved too, hampering food production for the next decade.

In the coldest part of the Little Ice Age, during the 16th and 17th centuries, famine struck repeatedly. The combination of famine and bubonic plague reduced Britain’s population from 5 million to 4 million, and life expectancy dropped from 48 years to 38. The population of the Indian subcontinent dropped from 200 million in A.D. 1200 to 140 million in 1600.

Farmers in the densely populated Low Countries and England were driven to try new farming methods: Multi-ox hitches were invented to pull deep plows through the rich heavy lowland soils, which had defied earlier farmers. They tried new root crops from Asia, such as beets and turnips, that could be hoed to keep down weeds — instead of leaving half their fields fallow each year. They grew clover crops more frequently to replace the soil nitrogen taken up by their previous crops.

Climate and Agriculture. History and science both tell us that a warmer planet has beneficial effects on food production. It results in longer growing seasons, more sunshine, and more rainfall, while summertime high temperatures change very little. In addition, a warmer planet means milder winters and fewer crop-killing frosts in the late spring and early fall.

The present warming trend has not resulted in agricultural water shortages. Rather, rainfall is currently increasing moderately over most of the world. This is

not surprising. Global warming evaporates more water from the oceans, and it falls back down to earth in a re-invigorated hydrological cycle. The Illinois Water Survey tells us that U.S. rainfall has recently risen to match the rainfall of the late 1880s, when the end of the Little Ice Age was still bringing more storminess. Continued warming should enhance rainfall, rather than suppress it. And even if some areas do experience greater aridity under warmer conditions, both nature and humans have been through it many times before, and have adapted.

Global warming also brings additional CO₂, which acts like fertilizer for plants. As the planet warms, oceans naturally release huge tonnages of additional CO₂ that dwarf the output from our cars and factories. (Cold water can hold much more of a gas than warmer water.) For plants, it’s like letting Lance Armstrong carry an oxygen tank on his racing bike.

Since 1950, during a period of global warming, these factors have helped the world’s grain production soar from 700 million tons to more than 2 billion tons last year.

Conclusion: Benefits of Warming. History shows that a warmer world is better for human health on average. It tends to boost agricultural productivity, which reduces hunger and the illnesses that inadequate nutrition help produce. In addition, weather patterns are generally more stable with fewer catastrophic weather events, and warm weather produces far fewer deaths than cold weather. These factors contribute to longer average life spans and increased human populations during climactic warm periods compared to cooler times.

From the perspective of human health, people have far more to fear from the next full Ice Age than the modest warming that the 1,500-year climate cycle indicates the planet will experience in the coming century.

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