



# *The* "YEAR WITHOUT A SUMMER":

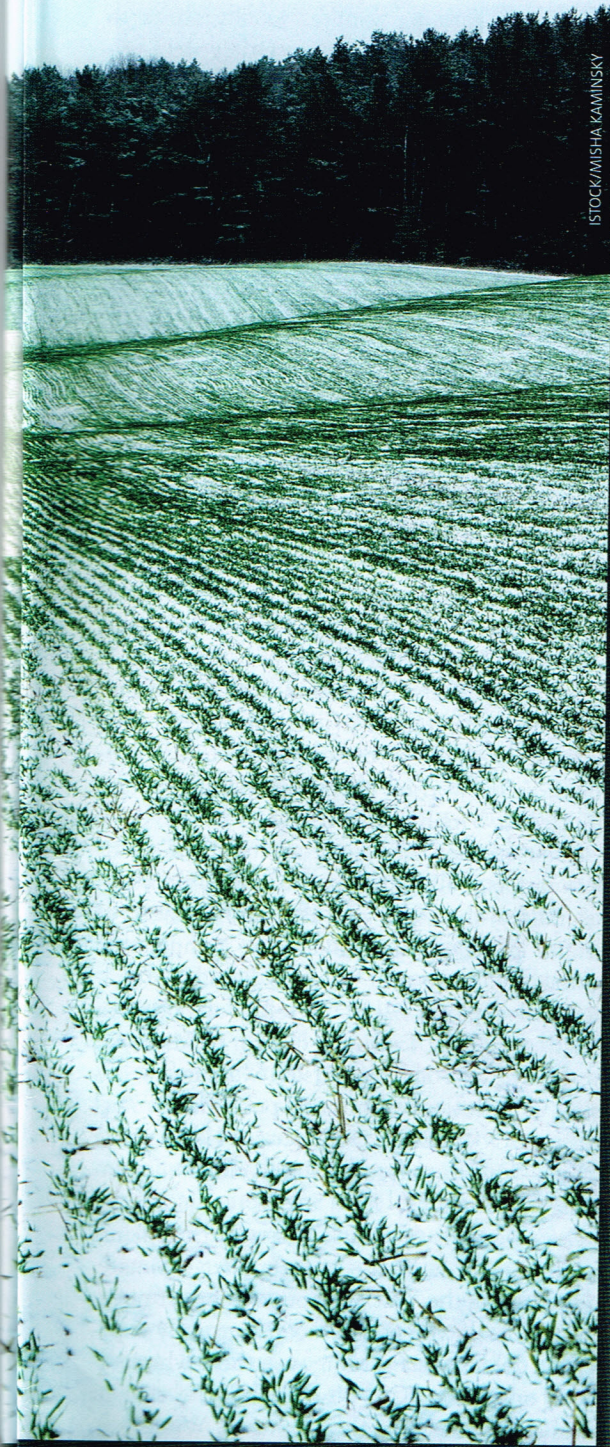
## *Two Hundred Years of Facts, Fiction, and Folklore*

by Don Lipman

Many crops failed due to the cold weather in 1816.

**T**he year 1816 went down in history as the "Year Without a Summer," also known as the "Poverty Year," and, more humorously, "Eighteen-Hundred-and-Froze-to-Death." There have been numerous articles written about that infamous summer, including in the pages of *Weatherwise*, but the upcoming 200th anniversary of the event merits a closer look at a meteorological phenomenon that may never be seen again.





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## The Facts: Impact on the Northeastern United States

After a number of hard winters in the Northeast during the early part of the 19th century, the winter of 1815–1816 was relatively unremarkable and in some places even mild. But as the spring of 1816 edged toward summer, the seasons seemed to go into reverse, so that by mid-May, there were repeated episodes of killing frosts from New England all the way down to Virginia.

Although the following summer *did* have brief warm spells of two or three days, overall the season was hardly summer-like. Unquestionably, July and August had their share of cool-to-coldish periods, but it was May and particularly June that stole most of the records.

By mid-May, a series of cold air masses, each progressively colder, crossed through New England, bringing rain and even some snow to northern areas. But there was little agricultural damage, as crops had not yet matured sufficiently. Nevertheless, on May 29, politician David Thomas, in his *Travels Through the Western Country in the Summer of 1816*, wrote from Erie, Pennsylvania, “This morning was very frosty and ice covered the water one-quarter inch thick. We had a brisk breeze from the northeast ... a severe frost attended this morning.” And in his diary, Adino Brackett (1777–1847) wrote, “The whole of the month has been so cold and wet that wheat could not be sown ‘til late and then the ground could not be well prepared.”

The first few days of June gave little indication of what was to follow. By June 6, an unusually cold air mass invaded much of New York and New England and lingered for several days. Then a strong Nor’easter developed, and it snowed in many locations in southern New England, whitening the ground in elevated terrain and “flurrying” at sea level locations. According to former NOAA meteorologist Lee Foster, as the storm entered the Canadian Maritimes on June 7, it dumped six to 12 inches of snow over most of Northern New England with reports of two-foot drifts in Quebec City, Quebec, Canada.

Throughout the rest of June, repeated intrusions of cold air, alternating with brief warm—and even hot—spells, first frightened and then heartened farmers, as well as the general population, who worried about the state of the food supply. Newspapers of the day, however, tried to downplay the danger when possible, acknowledging the failure of some crops, but noting that others seemed to be thriving, despite an ongoing drought.

While seasonal departures in July and August were not quite as extreme or extensive as May and particularly June, there were, nevertheless, some major (for the season) cold spells, which focused mainly on northern areas. But each time a cold blast relaxed its grip, the press, again, would take the optimistic view: “Yes, some crops had been damaged but hardier crops, such as wheat and rye, seemed to be thriving.” All in all, by the end of the growing season in September, New England crop yields, particularly corn, were a fraction (10%) of normal, and although there was no panic yet, there was great concern about the



food supply for the coming winter and beyond.

For the most part, the year 1816 was not the Northeast's coldest on record, mostly because of the mild winter and fall. However, in many locations, it does represent the coldest or second-coldest summer on record. For example, according to *The Philadelphia Area Weather Book*, the average summer temperature during 1816 in that city was 66°F, making it the coldest on record and five degrees below the modern record. Elsewhere, average temperatures in much of Massachusetts and Connecticut were: five degrees below normal for May; five to seven below normal for June and July; one to three below normal for August; and one-half to five degrees below normal for September.

## The Aftermath

Since the first Europeans didn't really inhabit the Northeast until the early 1600's, by the time the year 1816 arrived, there was approximately 200 years of weather records, at least in the form of generation-to-generation stories. Never before had anyone heard of a year without a summer and the resulting food shortages that one could bring. Therefore, the near famine, or at least prospect of a famine, that resulted from the 1816 summer caused people to think seriously about what the future would hold. What if there was a repeat and crops failed again? Would everyone starve to death?

As a result, many people, especially farming families, decided that they didn't want to take a chance on another "doomed" harvest. So they moved elsewhere. They didn't want to move north because it would be even colder there. "They tended not to move south either because,

at the time, farming families usually chose to move latitudinally, partly because they were unfamiliar with agricultural methods at different latitudes. Moreover, the "Equal Latitude Myth" hypothesized by *Weatherwise* founder David Ludlum—author of many meteorological monographs, and one of the most respected weather historians of the 20th century—still persisted. (Early Americans still believed that the weather was the same at the same latitude all around the world.)

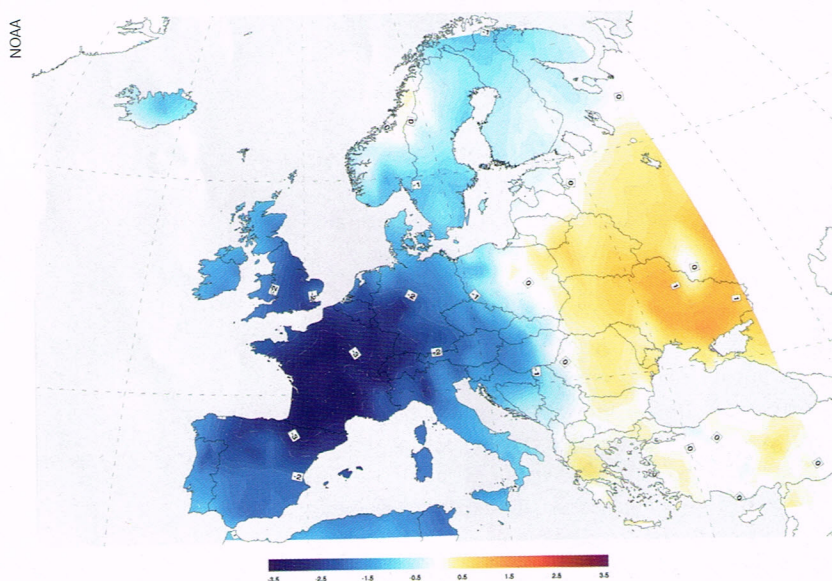
So the migration westward started in earnest. Many former New Englanders and mid-Atlantic residents trekked over the Appalachians to their new homes in western New York and Pennsylvania, as well as the Midwest—the Ohio Country, as it was called. Unfortunately for them, the migrants also believed in another myth, one that conflicted with the above-mentioned "equal latitude myth." Proposed by Thomas Jefferson, it was called the "Ohio Country Myth," which postulated that the Ohio Country was milder than the mid-Atlantic. (Jefferson, the retired third president of the nation, was personally affected, as he worried about the viability of his Monticello, Virginia, farm.)

Jefferson, normally quite astute about scientific matters, believed that the "Ohio Country" was milder than the mid-Atlantic because of certain plant species and false temperature reports that were sent back to him by an ill-informed explorer. And his sense of optimism spread, as Shirley T. Wajda, curator of history at the Michigan State University Museum, writes about Connecticut author and publisher Samuel Griswold Goodrich in *Connecticut History.Org*: "Ohio—with its rich soil, its mild climate, its inviting prairies ...."

Once settled, of course, eastern transplants encountered a harsher—not a milder—climate, and although the Year Without a Summer never repeated itself, the new Ohioans certainly experienced colder winters. Moreover, those who journeyed on to the "Old Northwest," the current states of Indiana, Illinois, Michigan, Wisconsin, and part of Minnesota, faced even frostier winters, not the mild—even tropical—conditions that some believed existed west of the Mississippi.

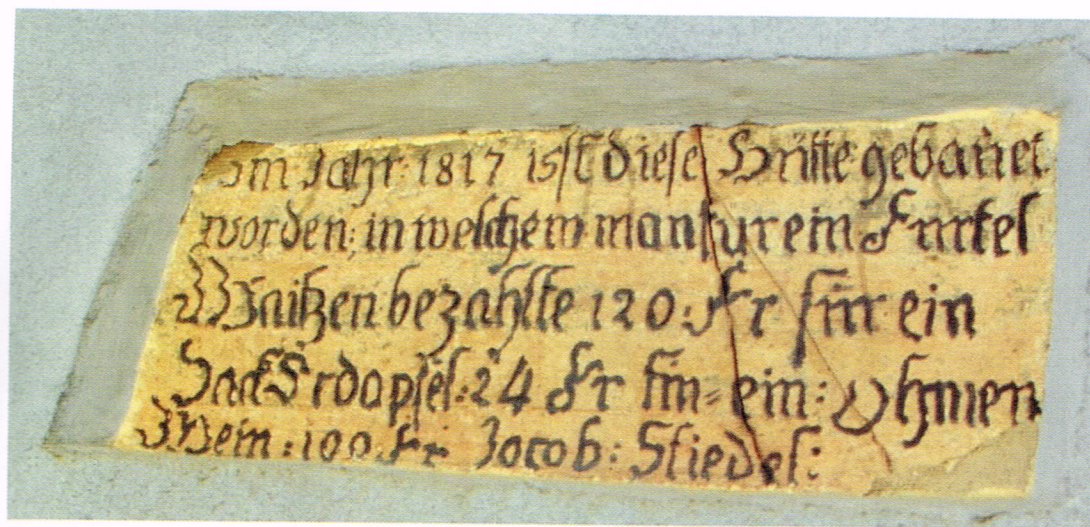
## Impact on Europe

While the hardships of the Year Without a Summer in the eastern portion of the United States were well documented, little is known about the effects of the "summerless" summer of 1816 on western North America, which, at the time, was very sparsely settled. However, there is documentation about the difficulties faced by those in Europe at the time. The hardships in



Average European temperature anomaly during the summer of 1816.





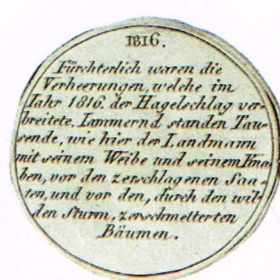
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An inscription on a wall in Heiligenstein, Bas-Rhin, Germany, recalling the terrible famines of 1816.

Europe, particularly western Europe, were as bad, if not worse, than eastern North America.

In Ireland, similar conditions prevailed as in the American Northeast, although probably not as bad as that of The Great Famine of 1845–1849. With the failure of the main food crops, people resorted to rioting and begging throughout Ireland, as well as Wales, Great Britain, and Germany. According to Al Gore's *Earth in the Balance: Ecology and the Human Spirit*, it was the worst overall European famine of the 19th century. And according to a BBC documentary based on Swiss records, there were 100,000 more European deaths than normal in the year 1816. And a letter from Paris, written in October 1816, which was published in a number of American newspapers, read, "All accounts agree that in the memory of no man living, has a season been so cold...."

Perhaps one of the most legendary of all events to occur in Europe during the Year Without a Summer was not even a weather event at all. It was a literary one—but one certainly related to the weather. As one version of the story goes, Lord Byron, the great English poet, loved to summer at his chalet with his guests on the shores of Lake Geneva in Switzerland. The summer of 1816 was inhospitable, to say the least, for leisurely outdoor strolls, so Byron challenged his housebound guests to write some sort of lurid horror story—something as dark and foreboding as the weather outside. Byron offered a prize to the winner, who, as most of us know, was 19-year-old Mary Shelley, wife of poet Percy Shelley. Mary took top honors with her story *Frankenstein*. Another guest attending that auspicious occasion, John Polidori, reworked Byron's *The Vampyre: A Tale*. Byron, himself, wrote *Darkness*.



WIKIMEDIA COMMONS/JOHANN THOMAS STETTNER AND GEORG ADAM

Etchings depicting the famine in Europe in 1816.





Portrait of Lord Byron by Richard Westall.



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## Impact on Asia

Although the most serious impact of the Year Without a Summer seems to have been in eastern North America and western Europe, other parts of the Northern Hemisphere—and, as mentioned, even the Southern Hemisphere—were also affected. In China, there were widespread floods and frigid temperatures that froze the summer rice crop, causing widespread famine. Even tropical Taiwan experienced cold and snow. In some cases, "desperate Yunnanese resorted to eating white clay, while parents sold their children in the town markets or killed them out of mercy."

If the impact on China and the rest of the Northern Hemisphere wasn't bad enough, one of the greatest indirect effects of the Year Without a Summer was on the "disease ecology of the Bay of Bengal." Due to volcanic-eruption-induced drought, and later, flooding, the regular monsoon season in that area was affected in such a way "that it was thought to have induced a deadly, rare strain of cholera. The disease swept around much of the world, so that by century's end, millions had died."

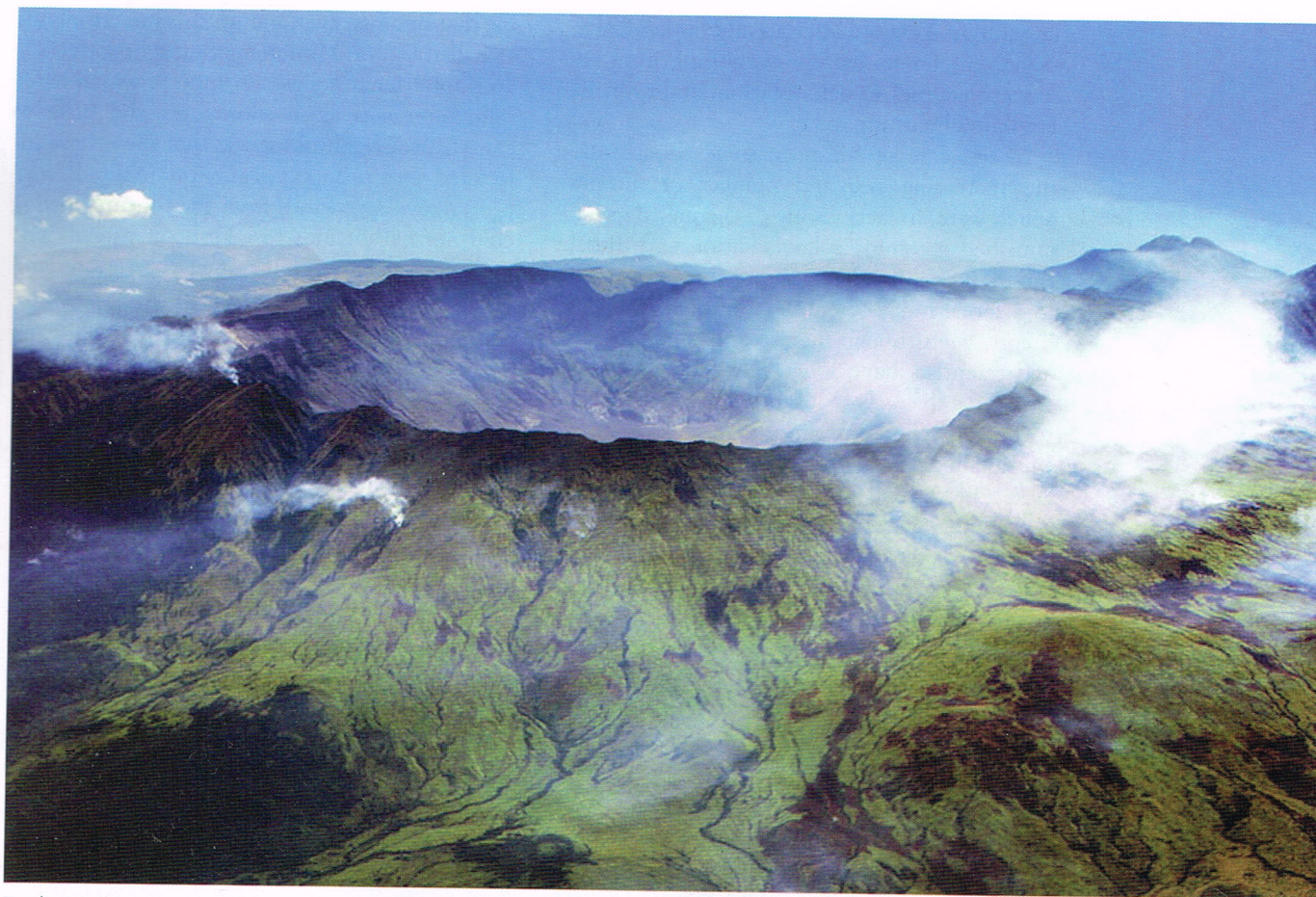
It is thought that as a result of the Yunnanese crop failures, a new, much more reliable—and lucrative—cash crop was needed. The solution: opium, which was originally harvested in Yunan, but later adopted to the south, in Burma (now Myanmar), Laos, and Thailand—the "Golden Triangle."

## The Cause

Today, most mainstream scientists and meteorologists point to volcanic eruptions as the main reason for the Year Without a Summer, in particular that of Mount Tambora (or Tomboro) on the southern Indonesian island of Sumbawa, in the "Ring of Fire." Although four other major volcanic eruptions took place during the previous five years, Tambora, which erupted from April 7–12, 1815, was the most powerful and the most deadly, burying or incinerating more than 10,000 people in its immediate "killing zone." Another 70,000 might have died through disease and starvation, as crops were decimated.

And although the eruption, possibly the deadliest in recorded history, was itself devastating, it was the tremendous volume (55 million tons) of sulfur dioxide gas, blown 20 miles into the stratosphere, that actually caused the Year Without a Summer. While most of the pumice (solidified lava) and other heavier particles rained down from the lower atmosphere quickly, the gas reaching the stratosphere was eventually transformed into a sulfuric acid aerosol. This aerosol circled the globe for years, reflecting incoming





Tambora Caldera, 199 years later.

solar radiation back into space and, scientists believe, causing the Year Without a Summer the following year.

The 1815 Tambora eruption had a volcanic explosivity index (VEI) of 7, one of only four at that level in the last 10,000 years. It is considered by some to be the deadliest eruption in recorded history and was heard more than 1,000 miles away. It is said that the eruption caused ash-related darkness for three days for hundreds of miles in every direction (probably mostly downwind). The mountain originally stood at 14,100 feet, but the eruption blew the top third away, reducing the mountain to only 9,354 feet and leaving a large caldera, or crater.

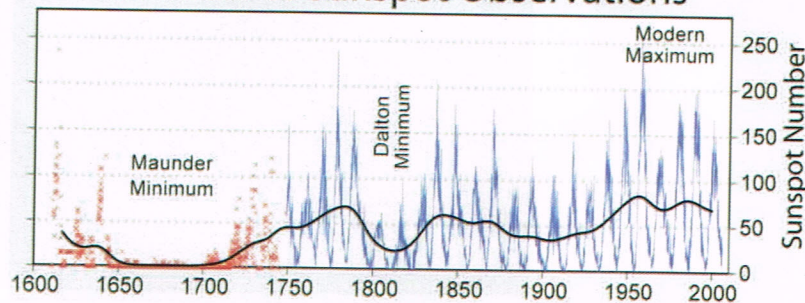
By comparison, the more well-known Krakatoa (Krakatau) eruption of 1883 caused half as many casualties and spewed less than one-third of the ejecta into the atmosphere as Tambora's 38 cubic miles. By comparison, the volume of ejecta from the 1980 eruption of Mount Saint Helens was only one-quarter of a cubic mile. But due to much improved communications, news of Krakatoa's eruption was quickly transmitted by telegraph far and wide and became a world-wide media event.

## The Fiction

Many accounts of the Year Without a Summer refer to snow, or at least flurries, occurring during all of the three meteorological summer months of June, July, and August from New England to Virginia. But, interestingly, Ludlum found no anecdotal or other evidence of July and August snow, at least at low elevations. There is little doubt, however, that periodic killing frosts did occur during both months.

With no clear explanation for the Year Without a Summer at the time, people came

## 400 Years of Sunspot Observations



Frequency of sunspots, which some blamed for the unusual cold, from 1600–2000.



up with all sorts of ludicrous and outlandish explanations for its cause—everything from sunspots to eclipses to deforestation, and even Ben Franklin's lightning rod.

In the case of sunspots, some thought that the increasing size and number of sunspots, which were, in fact, visible to the naked eye, diminished incoming solar radiation and thereby caused a cooling effect. Strangely, Wajda refers to a modern-day scientific confirmation of this theory, even though mainstream meteorologists and scientists have long believed that, if anything, it's the *lack* of sunspots that is associated with atmospheric cooling, e.g., the "Maunder Minimum" (1645–1715) during the "Little Ice Age" (1400–1850).

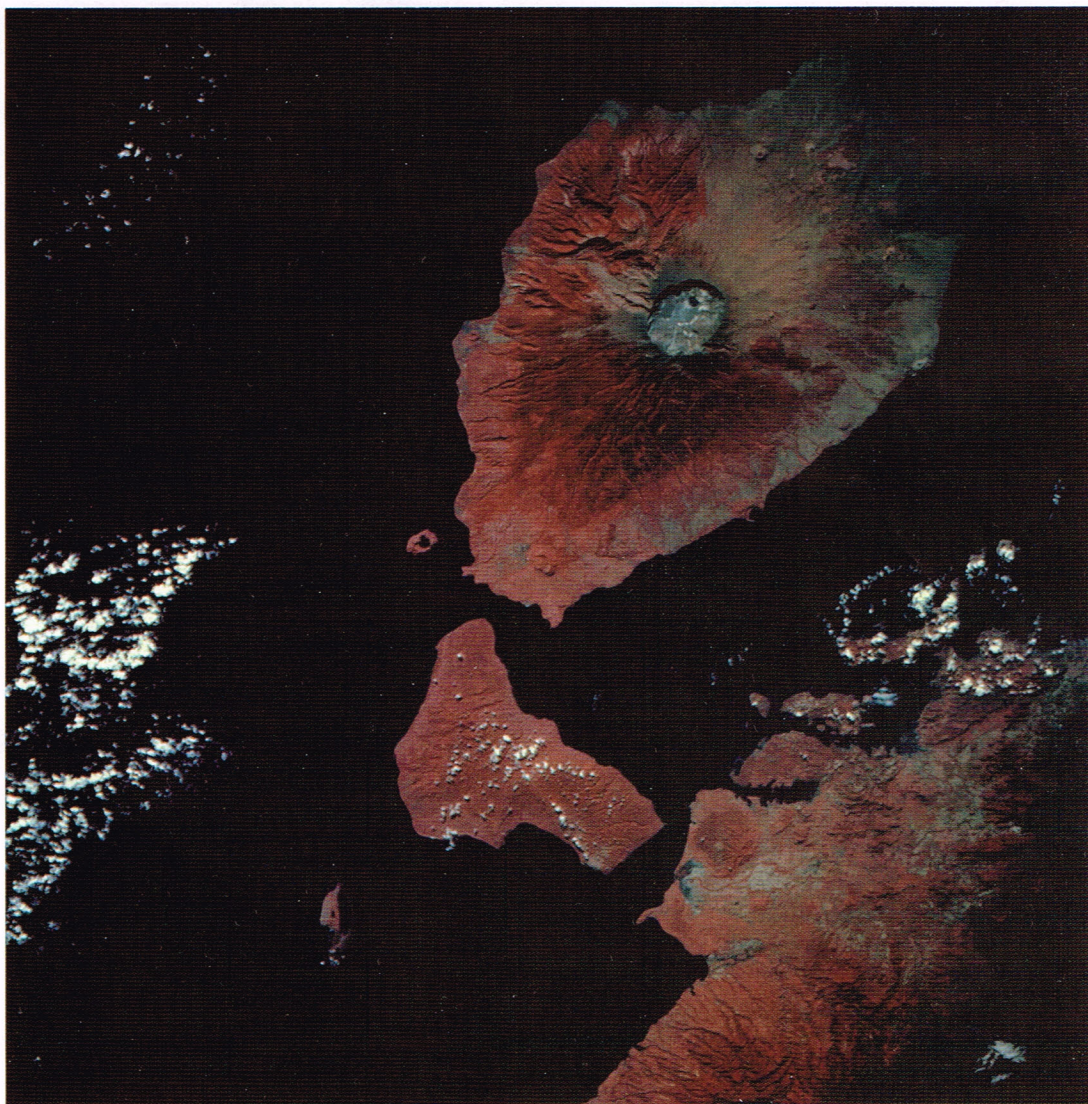
During the frosty 70-year stretch of the Maunder period, sunspots were almost nonexistent. But by 1816, sunspots had reappeared, and, as mentioned, were fairly obvious at sunset dur-

ing that summer, even though this was during the so-called Dalton Minimum of sunspot activity.

A total lunar eclipse on June 9, which came right after a freakish snowstorm, did little to calm fears. The thinking was that the eclipse interfered with the moon's gravitational pull, suppressing warmer winds from the south, allowing cold northerly winds to take hold instead. The evidence: massive wind-caused vegetation damage throughout the countryside.

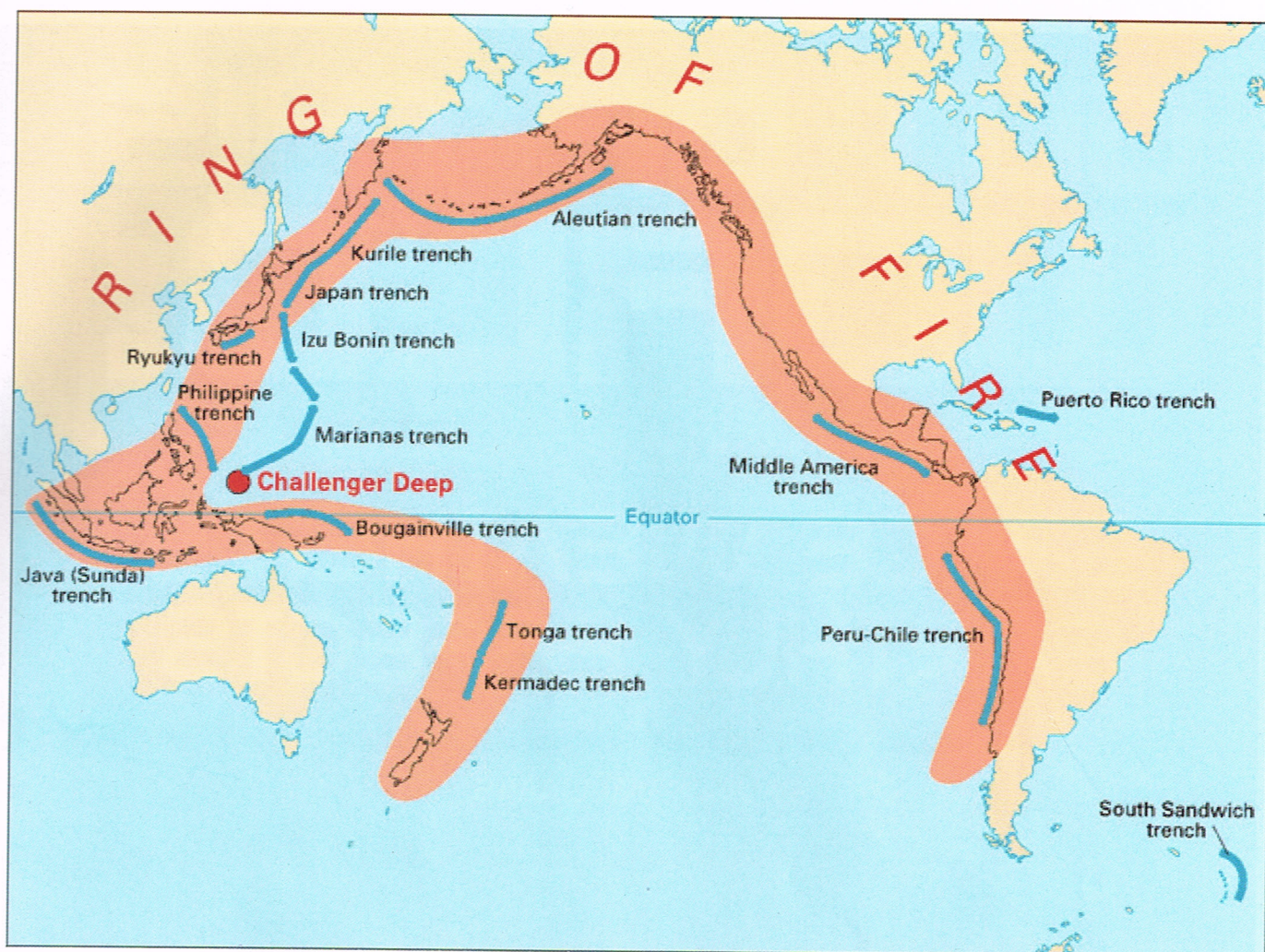
Others theorized that clear-cutting the forests and the constant turning of topsoil caused the Year Without a Summer by allowing the earth's heat to escape more readily into the atmosphere. (Later in the century, people believed just the opposite: that clear-cutting and deforestation had a warming effect by allowing more sunlight to reach the ground—one of Ludlum's other "six great American climate myths.") Yes, even in the late nineteenth century people thought that

NASA/IMAGE SCIENCE AND ANALYSIS LABORATORY



Infrared image of Mount Tambora, Sumbawa Island, Indonesia, which most scientists currently blame for the Year Without a Summer.





The "Ring of Fire," is a 25,000 mile horseshoe circumscribing the Pacific from southern South America all the way to New Zealand.

winters had become more benign. In this case, though, it likely was that the northern hemisphere was finally recovering from the 400- to 500-year-long "Little Ice Age."

Other reasons given for the bizarre behavior of the weather during the summer of 1816 even included great fields of ice floating in the Atlantic; Benjamin Franklin's lightning rod experiments, which some thought were disrupting the atmospheric heat budget; and, of course, the wrath of God.

## The Folklore

Of all the stories that have been told and retold about the Year Without a Summer, perhaps the most bizarre is that associated with the 1816 issue of *The Old Farmer's Almanac*, or, as it was then known, *The Farmer's Almanac*. This publication, first published by Robert B. Thomas in 1792, is the oldest continuously published periodical in the United States.

As Judson Hale Sr., current Editor-in-Chief of the *Almanac*, tells it, the story is bizarre indeed.

At the time, the presses were running in 1815 for the 1816 issue, and Thomas was sick in bed with the flu. Either as a joke or in error, the printer (a human being, of course) transposed the forecasts of January and February with July and August, thus predicting snow in the latter months.

Thomas supposedly found out about the error, stopped the presses, and reissued the entire press run, destroying all issues containing the error. But he was unable, so the story goes, to retrieve all copies. When the story got out about the summertime snow, Thomas went into total denial and was harrassed and humiliated, to say the least. However, when the following summer did reportedly arrive with cold and snow, Thomas did, of course, take full credit. **W**

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