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Ancient scripts tell how cold it used to be

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EINSIEDELN, Switzerland — A librarian at this monastery dating from the 10th century leads a visitor beneath the vaulted ceilings of the archive past the skulls of two former abbots.

He pushes aside medieval ledgers of indulgences and absolutions, pulls out one of 13 bound diaries inscribed from 1671 to 1704 and starts to read about the weather.

"Jan. 11 was so frightfully cold that all of the communion wine froze," said an entry from 1684 by Brother Josef Dietrich, governor and "weatherman" of the once-powerful Einsiedeln Monastery. "Since I've been an ordained priest, the sacrament has never frozen in the chalice."

"But on Jan. 13, it got even worse, and one could say it has never been so cold in human memory," he added.

Diaries of day-to-day weather details from the age before 19th-century standardized thermometers are proving of great value to scientists who study today's climate.

Historical accounts were once largely ignored, as they were thought to be fraught with inaccuracy or were simply inaccessible or illegible.

But the booming interest in climate change has transformed the study of ancient weather records from what was once a "wallflower science," says Christian Pfister, a climate historian at the University of Bern.

The accounts dispel any lingering doubts that the Earth is heating up more dramatically than ever before, he says.

Last winter — when spring blossoms popped up all over the Austrian Alps, Geneva's official chestnut tree sprouted leaves and flowers, and Swedes were still picking mushrooms well into December — was Europe's warmest in 500 years, Pfister says. It came after the hottest autumn in a millennium and was followed by one of the balmiest Aprils on record.

"In the last year there was a series of extremely exceptional weather," he says. "The probability of this is very low."

Shifts in the weather

The records also provide a context for judging shifts in the weather. Brother Konrad Hinder, the current weatherman at Einsiedeln and an avid reader of Dietrich's diaries, says his predecessor's precise accounts of everything from yellow fog to avalanches give historical context.

"We know from Josef Dietrich that the extremes were very big during his time," he says. "There were very cold winters and very mild winters, very wet summers and very dry summers."

He adds that the range of weather extremes has been smaller in the 40 years he has recorded data for the Swiss national weather service.

"That's why I'm always cautious when people say the weather extremes now are at their greatest. Without historical context you lose control and you rush to proclaim every latest weather phenomenon as extreme or unprecedented," Hinder says.

Most historians and scientists delving deep into archives seek accounts of disasters and extreme weather events.

But the records can also be used to obtain a more precise temperature range for most months and years that goes beyond such general indicators as tree rings, corals, ice cores or glaciers.

Thrice-daily temp readings

Such weather sources include the thrice-daily temperature and pressure measurements by 17th-century Paris physician Louis Morin, a short-lived international meteorological network created by the grand duke of Tuscany in 1653, and 33 "weather diaries" surviving from the 16th century.

In Japan, court officers kept records of the dates of cherry blossom festivals, which allow modern scientists to track the weather of the time.

Early records often are discovered only by chance in documents that have survived in centuries-old European monasteries like Einsiedeln, or in the annals of rulers, military campaigns, famines, natural hazards and meteorological anomalies.

In Klosterneuberg, near Vienna, an unidentified writer noted a lack of ice on the Danube in 1343-1344 and called the winter "mild," while the abbot of Switzerland's Fischingen Monastery lamented the late harvest of hay and corn in the summer of 1639 when "there was hardly ever a really warm day."

Scores of similar clues are pieced together year by year to determine temperature ranges, says Pfister, whose team of four uses old "weather reports" to work back as far as the 10th century.

Pfister has found that from 1900 to 1990, there was an average of five months of extreme warmth per decade. In the 1990s, that number jumped to an unprecedented 22 months. The same decade also had no months of extreme cold, in contrast to the half-millennium before.

Even in the last major global warming period from 900 to 1300, severe winters were only "somewhat less frequent and less extreme," Pfister says.

Over the past century, temperatures have gone up an average of 1.3 degrees Fahrenheit, which is often attributed to the accumulation of greenhouse gases, primarily carbon dioxide, in the atmosphere.

Global warming is one of the world's top issues today because of fears of massive hurricanes and flooding. For most of history, though, it was the fate of farms and the fear of famine that encouraged careful weather observation.

The Einsiedeln abbots — princes within the Holy Roman Empire until 1798 — were powerful leaders who ruled over large swaths of central Switzerland's mountainous terrain.

Agriculture was the primary source of income for the region, and natural disasters such as floods and avalanches posed an omnipresent threat.

Debts accrued and honored, accidents, local conflicts and business transactions also fill Brother Dietrich's accounts, "but most days start with the weather," says Andreas Meyerhans, who cares for the monastery's precious documents.

Exceptional detail

The diaries — written in German sprinkled with old Swiss dialect and margin notes in Latin — are "unique" because of the exceptional everyday detail they provide, Pfister says.

He adds that centuries of weather records make it clear that people need to adapt when extremely hot or cold weather becomes more frequent.

Although the lives of earlier generations were ruled by the weather, "in the second half of the 20th century, people slept and became completely unprepared for natural disasters, because they happened so rarely."

In Einsiedeln, Hinder reads from a barometer flanked by the Virgin Mary, and worries that humanity is in trouble.

"God still controls the weather," he says. But, he adds, people must do their part by taking better care of the planet.

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