

Climate Change and Meteorology: What Meteorologists Want You to Know

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The Atmosphere Tells a Clearer Story than Headlines Do

When a major wildfire occurs, public discussion often shifts quickly toward questions about climate change, risk, and responsibility. For attorneys involved in wildfire-related litigation, however, the first step is to understand what atmospheric conditions existed before and during the event.

Before broader conclusions can be considered, the atmosphere itself must be reconstructed. This means forensic meteorologists examine measurable variables such as wind speed, humidity, pressure systems, temperature patterns, and fuel conditions to establish an objective record of the environmental conditions surrounding an event.

In January 2025, the Los Angeles wildfires developed under a well-documented set of atmospheric conditions. In a [February 2026 study published in AGU Advances](#), sustained winds during the critical burn period ranged from 40 to 80 km/h, with gusts ranging from 110 to 144 km/h. According to the [National Oceanic and Atmospheric Administration](#) (NOAA) meteorologist Ivory Small, relative humidity in the southern California terrain remained at or below 20 percent, and in some locations fell to single digits. These conditions were driven by a strong high-pressure system exceeding 1040 mb over the Great Basin, the internally draining desert basin spanning most of Nevada, portions of Utah, and parts of Oregon, Idaho, and California, which forced a northeast-to-southwest pressure gradient across southern California.

That gradient channeled air through the region's east-west mountain passes and canyons, producing the powerful, desiccating offshore flow known as Santa Ana winds. As the airmass descended and compressed, it shed moisture rapidly. This process, once sustained for 24 to 48 hours, can drive relative humidity below 15 percent and produce the extreme fire-weather conditions documented during the January event. Those are measured conditions, and they matter because meteorology begins with observation.

For attorneys, this level of atmospheric detail is potential evidence. Wind speeds, humidity readings, and pressure gradients are the kind of verifiable, reproducible data points that can support or undermine arguments about negligence or foreseeability. Understanding what these variables represent allows attorneys to better evaluate expert reports, understand meteorological analyses, and distinguish documented conditions from later interpretations.

In my work as a forensic meteorologist, I start by reconstructing what the atmosphere was doing at a specific time and place. I look at wind speed, humidity, pressure gradients, temperature

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anomalies, and other variables that can be verified through data. I do not determine causation, assign blame, or draw legal conclusions. My role is to establish atmospheric facts using validated sources and reproducible methods.

That distinction is important because wildfires inevitably spark climate change debates. Meteorological analysis, however, does not begin with attribution, but with reconstruction. Only after the physical conditions are clear can we assess whether they fit into a broader climate pattern.

How Climate Signals Are Identified

A wildfire itself does not define climate change. It is a single event occurring within a larger atmospheric system.

To understand whether climate change is playing a role, I must shift from the event to the pattern. That means looking at long-term datasets, usually over 30 years or more, which aligns with the [World Meteorological Organization's](#) standard for climate normals. From there, I can examine whether drought, wind regimes, temperature anomalies, or seasonal timing are changing over time.

For example, drought conditions before the Los Angeles fires can be quantified with precipitation deficits and soil moisture data. [Santa Ana wind events](#) can be evaluated for frequency, intensity, and seasonal behavior across decades. Temperature anomalies can be compared against historical baselines to see whether the climate itself is shifting. [Research](#) also shows that warming is contributing to drier atmospheric conditions and longer fire seasons in many regions.

From a forensic standpoint, the key question is not whether climate change caused a specific fire. The better question is whether the environment in which that fire occurred has changed over time.

What Meteorologists Measure

Meteorology is grounded in observable variables. When I reconstruct atmospheric conditions, I focus on data that can be checked, repeated, and defended, including wind velocity, humidity, temperature departures from normal, pressure systems, and metrics such as vapor pressure deficit, which helps describe how dry the atmosphere is and how quickly fuels can lose moisture. They are measurable through surface stations, satellite observations, and reanalysis datasets.

Organizations such as the [National Oceanic and Atmospheric Administration](#) (NOAA) maintain long-term records that allow these variables to be analyzed over time. These datasets show clear trends, including increases in temperature, shifts in precipitation patterns, and changes in the frequency of extreme weather conditions.

The [Intergovernmental Panel on Climate Change](#) (IPCC) has shown that human-induced warming reached $\sim 1.1^{\circ}\text{C}$ above pre-industrial levels for the 2010-2019 period ($0.8\text{-}1.3^{\circ}\text{C}$ range), based on decades of consistent data across datasets. This conclusion is not derived from isolated events, but from consistent patterns observed across decades.

This estimate refines the approximately 1.0°C figure reported in the earlier Special Report on Global Warming of 1.5°C (SR1.5, 2018), reflecting continued warming and improved attribution methods. This conclusion is not derived from isolated events, but from consistent patterns observed across decades.

This is how climate change becomes visible—not in a single dataset, but in the agreement between many.

Why Events Are Often Misinterpreted

One of the most common mistakes is treating a single disaster as if it can explain itself.

A wildfire, flood, or heatwave is immediate and dramatic, so it naturally invites explanation. But without context, people can over-attribute the event or understate it.

For example, the [2025 Los Angeles wildfires](#) were driven by extreme wind conditions, low humidity, and dry fuels. These factors can be directly measured and reconstructed. At the same time, broader datasets show increasing wildfire losses globally and rising exposure in fire-prone regions.

According to the [United Nations Office for Disaster Risk Reduction](#) (UNDRR), economic losses from wildfires have increased significantly over the past decade, driven by both environmental changes and expanding development in high-risk areas.

Both statements can be true at the same time. The event has immediate causes. The risk environment has long-term trends. Separating those two is essential for accurate interpretation.

Climate Change as a Shift in Conditions

Climate change is best understood not as a trigger, but as a shift in baseline conditions.

Warmer temperatures increase evaporation and reduce fuel moisture. Changes in rainfall patterns affect how vegetation grows and dries. Atmospheric circulation can also influence when and how wind events occur. In that sense, climate change can raise the likelihood of certain extreme conditions without directly causing every individual event.

This framework, often referred to as probabilistic attribution, evaluates how the probability of an event changes under different climate conditions. From a forensic perspective, this aligns with

how we evaluate evidence. We establish what happened, quantify the conditions, and then assess how those conditions compare to historical baselines.

The Role of Clear Interpretation

The challenge is rarely a lack of data. It is usually how that data is communicated.

Meteorologists have a responsibility to discuss climate change education and explain what the data shows, what it does not show, and where uncertainty remains.

The public understanding improves when scientific findings are [communicated with clarity and consistency](#). This is particularly important in climate science, where misinterpretation can lead to confusion about both risk and responsibility.

In my work, whether for litigation or public analysis, the objective is to present the data, explain the conditions, and distinguish between observation and conclusion.

Wildfires occur under specific atmospheric conditions that can be measured, reconstructed, and analyzed with precision. Wind speeds, humidity levels, pressure gradients, and fuel conditions provide a factual record of the environmental conditions present before and during an event. Those observations represent the foundation of forensic meteorological analysis.

Climate analysis serves a different purpose. It examines long-term patterns across decades to determine whether environmental conditions are changing over time. While those broader trends may provide important context, they are not substitutes for event-specific atmospheric reconstruction.

When lawyers understand the difference between documented atmospheric conditions and long-term climate trends, they are better equipped to evaluate expert testimony, understand the scientific evidence presented in a case, and determine whether conclusions are supported by the available data.

Conflating the two can lead to misunderstandings of both meteorology and climate science. Separating them allows each form of evidence to be evaluated within its proper scientific framework.