Air Pressure and the Falling Glass

By the rock. August 23, 2026. Grounded in National Weather Service definitions.

The short version

A barometer weighs the column of air above you. One reading by itself says almost nothing; the change over time, the tendency, is where the forecast lives. The Weather Service tracks pressure tendency as the change over three hours: steadily falling means a low or a front is approaching, the steeper the fall the stronger or closer the system, and the sharp turn from fall to rise usually arrives with the front itself. Every reading on a weather map is first corrected to sea level, because raw station pressure mostly measures your altitude.

Weighing the sky

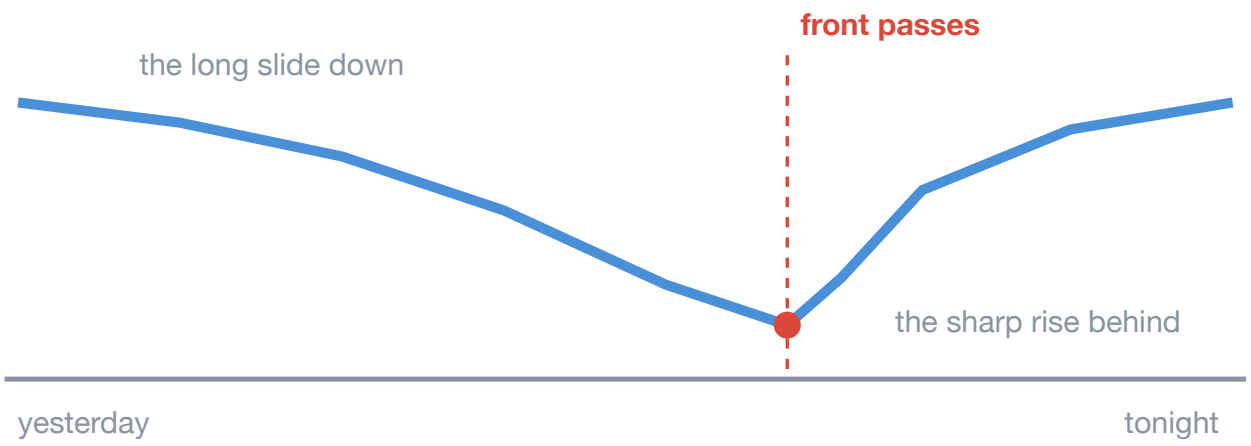
Air has weight, and a barometer is a scale. It reports the weight of the entire column of atmosphere standing on top of you, top of the troposphere and all. At sea level that column averages 1013.25 millibars, which older instruments render as 29.92 inches of mercury: the height of a mercury column the air can hold up. When the reading falls, air is literally leaving the column above your house. Something lighter is moving in, and lighter columns are what storms are made of.

What the atmosphere does about differences in pressure, which is to say the wind, and how those differences are drawn on a map as isobars, is its own lesson. This page is about the older and simpler instrument trick: sitting in one spot and watching the number move.

The tendency is the forecast

A single pressure reading is like a single frame of a film. Is 1008 millibars stormy? It depends entirely on whether it was 1015 three hours ago or 1002. The observation that matters is the tendency, and the Weather Service standard is the change over three hours: rising, falling, or steady, plus the shape of the trace. Observers even have remark codes for the dramatic cases, PRESFR and PRESRR, pressure falling rapidly and pressure rising rapidly, because a steep tendency is worth interrupting the record for.

The classic pre-frontal signature reads like a sentence. Ahead of an approaching low or front, the pressure slides downward for hours, gently at first, then harder as the system closes in. The minimum on the trace arrives at or just ahead of the frontal passage itself. Then the turn: behind a cold front the pressure does not drift back up, it jumps, rising sharply as the dense cold air mass piles in. If you watch one instrument through one frontal passage, you will see the whole story drawn as a single line.



One instrument, one line, one front. The minimum is the passage; the steepness on either side is the system's strength. Sailors read this curve for two centuries before anyone drew a weather map.

The falling glass

Before satellites, before radio, a ship's entire forecast office was a mercury barometer bolted to the bulkhead, and the crews called it the glass. A falling glass meant a low was coming and there was nowhere to park. The old aneroid dials still carry the optimism of the era, printed clockwise: Stormy, Rain, Change, Fair, Very Dry, as if the needle position alone were the forecast. It never was. The sailors knew better, which is why their lore is about motion: long foretold, long last; short notice, soon past. A slow patient fall announces a big slow system that will overstay. A sudden dive announces something violent and brief. As lore goes, it is decent physics.

Station pressure versus sea level

One correction stands between your barometer and the weather map. Raw station pressure mostly measures elevation: climb a thousand feet and the reading drops roughly one inch of mercury, about 34 millibars, because that much atmosphere is now below you instead of above. Denver's raw pressure would look like a catastrophic hurricane to a coastal observer. So every station reduces its reading to what the barometer would say at sea level, and the corrected numbers are what maps compare. It also means a home barometer needs calibrating once: set it to the sea-level pressure from the nearest official observation, and from then on its absolute number is honest and its tendency, which needed no correction in the first place, was honest all along.

Catch a front in the act

This one needs a forecast with a front in it, which is rarely a long wait. Before it arrives, commit: write down when you think the pressure will bottom out. Then log the pressure every hour or two through the day, from this site's own reading for your spot or from the nearest Weather Service observation page, which publishes it around the clock. Watch the fall steepen, call the minimum before it happens, and check whether the wind shift and the sky's change of manners arrive with the turn, as the fronts lesson says they should. You are not simulating a barometer. You are reading a real one through a real frontal passage, which is the entire nineteenth century's forecasting career in one afternoon.

Check your understanding

1. Why is one barometer reading, by itself, nearly useless?

- □ A. Barometers are inaccurate instruments
- □ B. The forecast lives in the change over time, not the value
- □ C. Pressure only matters at sea

2. The pressure has been falling for six hours and the fall is steepening. The most likely story is:

- □ A. A high is building overhead
- □ B. A low or front is approaching and closing in
- □ C. The barometer needs new batteries

3. During a cold front passage, the pressure minimum typically arrives:

- □ A. Hours after the front has cleared
- □ B. At or just ahead of the frontal passage
- □ C. At random; pressure and fronts are unrelated

4. Why must station pressure be corrected to sea level before it goes on a map?

- □ A. Because sea level is where the weather happens
- □ B. Because raw readings mostly measure elevation, not weather
- □ C. Because inches and millibars disagree

5. The old sailors' rhyme says: long foretold, long last; short notice, soon past. In tendency terms it means:

- □ A. Slow falls mean big lingering systems, sudden dives mean violent brief ones
- □ B. Any fall means a long storm
- □ C. Forecasts made early are more accurate

Answer key

1. Why is one barometer reading, by itself, nearly useless?

B. The forecast lives in the change over time, not the value — The same reading can sit inside a fall or a rise, and those are opposite forecasts. Tendency, the three hour change, is the observation that speaks.

2. The pressure has been falling for six hours and the fall is steepening. The most likely story is:

B. A low or front is approaching and closing in — A deepening slide is the classic pre-frontal trace: air is leaving the column above you as the lighter system nears, and the steepness tracks its strength and approach.

3. During a cold front passage, the pressure minimum typically arrives:

B. At or just ahead of the frontal passage — The trace bottoms out as the front passes and then rises sharply behind it as the dense cold air mass moves in. The turn IS the passage, drawn in ink.

4. Why must station pressure be corrected to sea level before it goes on a map?

B. Because raw readings mostly measure elevation, not weather — Pressure drops roughly an inch of mercury per thousand feet of altitude. Without reduction to sea level, a map would show mountains as permanent monster storms.

5. The old sailors' rhyme says: long foretold, long last; short notice, soon past. In tendency terms it means:

A. Slow falls mean big lingering systems, sudden dives mean violent brief ones — A patient multi-day fall announces a large slow system; a sharp dive announces something intense and quick. It is a rule about the SHAPE of the trace, and it still holds up.

Questions people actually ask

What is a normal air pressure?

The sea-level average is 1013.25 millibars, or 29.92 inches of mercury. Day to day weather mostly lives within about 30 millibars either side of that, which is why the tendency, not the distance from average, carries the forecast.

How fast does pressure fall before a storm?

It depends on the system's strength and speed, which is exactly why forecasters watch the three hour tendency rather than a fixed number. A gentle multi-hour drift and a steep dive are both falls, and they promise different weather. Observers flag the extreme cases with the remark code PRESFR, pressure falling rapidly.

Can I use a cheap home barometer for this?

Yes. Set it once against the sea-level pressure from the nearest official observation so its absolute reading is calibrated. Its tendency was never wrong: rises and falls show up correctly on an uncalibrated instrument, and the tendency is the useful part.

Why does my ears popping in an elevator involve the same physics?

Climbing removes atmosphere from above you, so the pressure drops, faster in a fast elevator than in any storm. Your ears equalize across the difference. A strong storm's total pressure drop is similar to riding up a few hundred feet; the storm just does it without the building.

Where is the isobar and pressure-map side of this story?

On the wind page. What pressure differences do across a map, isobars, the pressure gradient, and why the wind spirals the way it does, is covered in why the wind blows; this page stays planted at one instrument in one spot.
