A Low-Level Significant Weather (LOW LVL SIG WX) Prognostic Chart is **a weather forecast for pilots, specifically focusing on conditions below 24,000 feet**. It provides a snapshot of expected weather conditions, including areas of IFR, MVFR, and VFR, turbulence, and freezing levels, to aid pilots in pre-flight planning.

Key Features of the LOW LVL SIG WX Chart:

- **Altitude Coverage:** Forecasts weather conditions from the surface up to 24,000 feet (FL240).
- **Time Coverage:** Typically provides 12-hour and 24-hour forecasts.
- **Issuance:** Issued four times a day by the National Weather Service Aviation Weather Center (NWS AWC).
- **Content:** Displays weather flying categories (IFR, MVFR, VFR), turbulence, and freezing levels, according to the Aviation Weather Center.
- **Visual Representation:** Uses color-coding and symbols to represent different weather phenomena, making it easy to interpret at a glance.
- **Surface Prog Integration:** May be combined with surface prog charts to create a four-panel presentation, showing both surface and low-level conditions.

How to Use the Chart:

1. Identify your flight area:

Locate your planned route on the chart.

2. Check weather flying categories:

Determine if your route is affected by IFR or MVFR conditions, which may require instrument training or alternate flight plans.

3. Assess turbulence:

Look for areas of moderate or greater turbulence, which are enclosed in dashed lines.

4. Identify freezing levels:

Note the freezing levels at your altitude, as this can affect aircraft icing.

5. Analyze progression:

Compare the 12-hour and 24-hour forecasts to understand how the weather is expected to change during your flight.

Important Considerations:

- The SIGWX chart provides a general overview of hazardous weather and is not a substitute for detailed terminal forecasts (TAFs) for specific locations.
- Pilots should also consult other weather resources, such as TAFs and PIREPs, to get a complete picture of the weather conditions.
- Understanding the chart's symbols and color-coding is crucial for accurate interpretation.

Key Takeaways

- The surface analysis chart shows current weather conditions at the surface and low altitudes.
- It's only valid for 3 hours.
- The chart uses symbols for station plots, pressure lines, and frontal boundaries.
- Station plots show local weather data like sky cover, pressure, temperature, wind, and significant weather.
- Pressure lines (isobars) indicate areas of equal pressure.
- Other features on the chart include highs and lows, troughs, ridges, dry lines, squall lines, and tropical waves.

What is a Surface Analysis Chart?

A surface analysis chart overlays weather conditions on a map. Pilots use it to get a visual understanding of phenomena like pressure, temperature, wind, and precipitation in the area at a given time.

The National Weather Service (NWS) generates surface analysis charts. The NWS operates the Weather Prediction Center, where you can find surface analysis charts, among others.

A surface analysis chart shows a snapshot of the weather at a specific time. It doesn't give forecasts or predict how the weather will change. That's the job of the Prognostic Chart, nicknamed the prog chart.

The distinction between current weather and forecasts is significant. Before you depart, you can check the surface analysis chart to help decide whether or not it's safe to take off. You can also use it to understand the conditions you'll encounter during your climb.

But depending on the flight length, the weather might be different by the time you land. That's why a prog chart is more suitable than a surface analysis chart for en-route and destination weather. The surface analysis chart might show clear weather right now. However, prog charts could indicate deteriorating weather at your expected arrival time.

Troughs and Ridges

In some cases, the isobars have elongated shapes that are not closed. If these shapes represent low pressure, they're called troughs. Their high-pressure equivalents are ridges.

Surface analysis charts show troughs as brown or yellow dashed lines. Troughs feature typical low-pressure weather, including gusty winds, clouds, and precipitation.

Most surface analysis charts don't show ridges. Charts that do display ridges depict them as yellow or brown zig-zag lines. Ridges have typical high-pressure weather with clear skies and light winds.

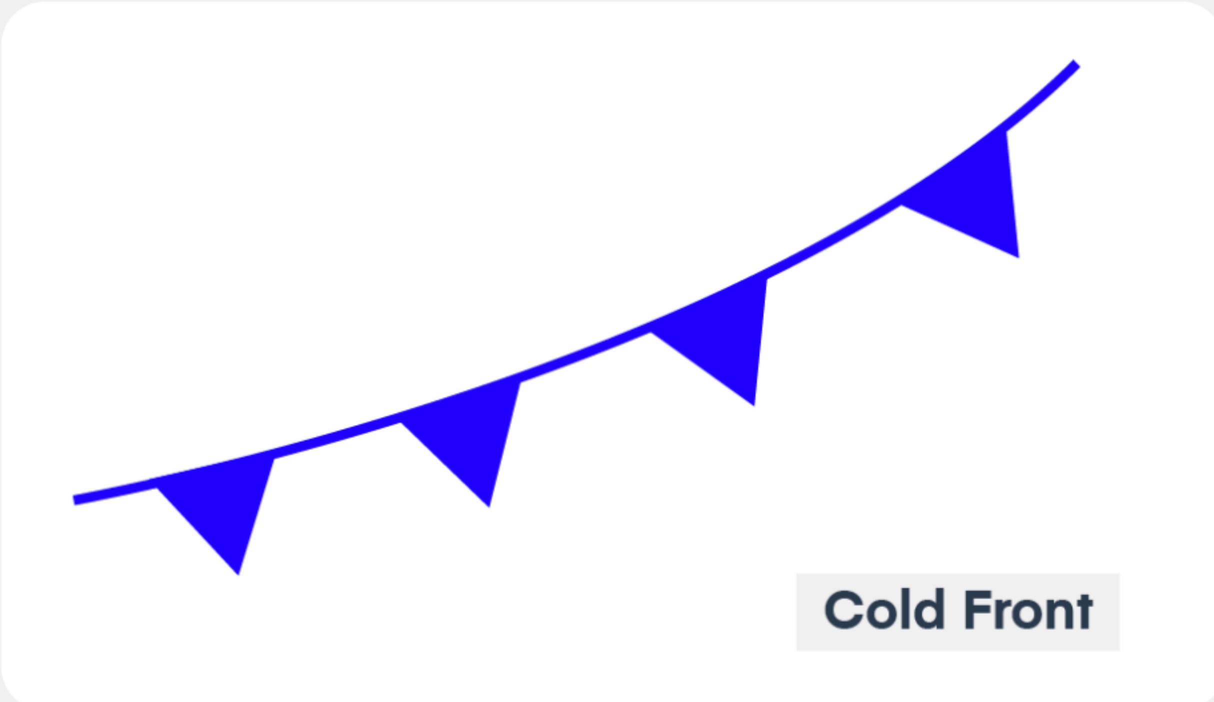
Warm Fronts

Warm fronts happen when a warm air mass moves to replace a cooler air mass. They're associated with gradual weather changes, including light rain, drizzle, and a temperature rise.

Warm fronts move slowly and can stay in an area for days. Since the warm air is lighter, it slides over the top of the cold air mass and gradually pushes it away.

Surface analysis charts represent warm fronts as a red line with semicircles pointing toward the warm air movement.

Cold Fronts

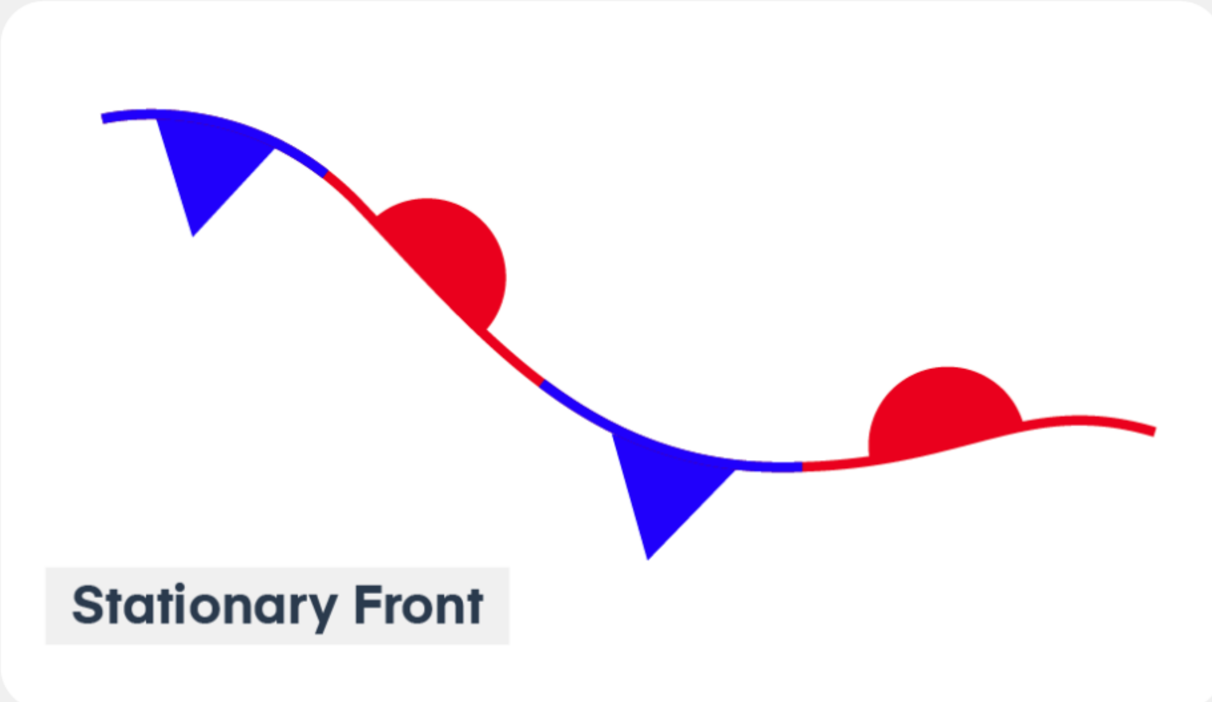


We get cold fronts when a cold, dense air mass advances and replaces a warm air mass. Cold fronts result in abrupt weather changes, such as thunderstorms, heavy rainfall, and temperature drops.

Cold fronts can travel at twice the speed of warm fronts. They form rapidly and generally cause violent weather activity along the frontal boundary. The cold air stays close to the ground and lifts the warmer air mass ahead of it.

On surface analysis charts, cold fronts are blue lines with triangular spikes pointing in the direction of their movement.

Stationary Fronts

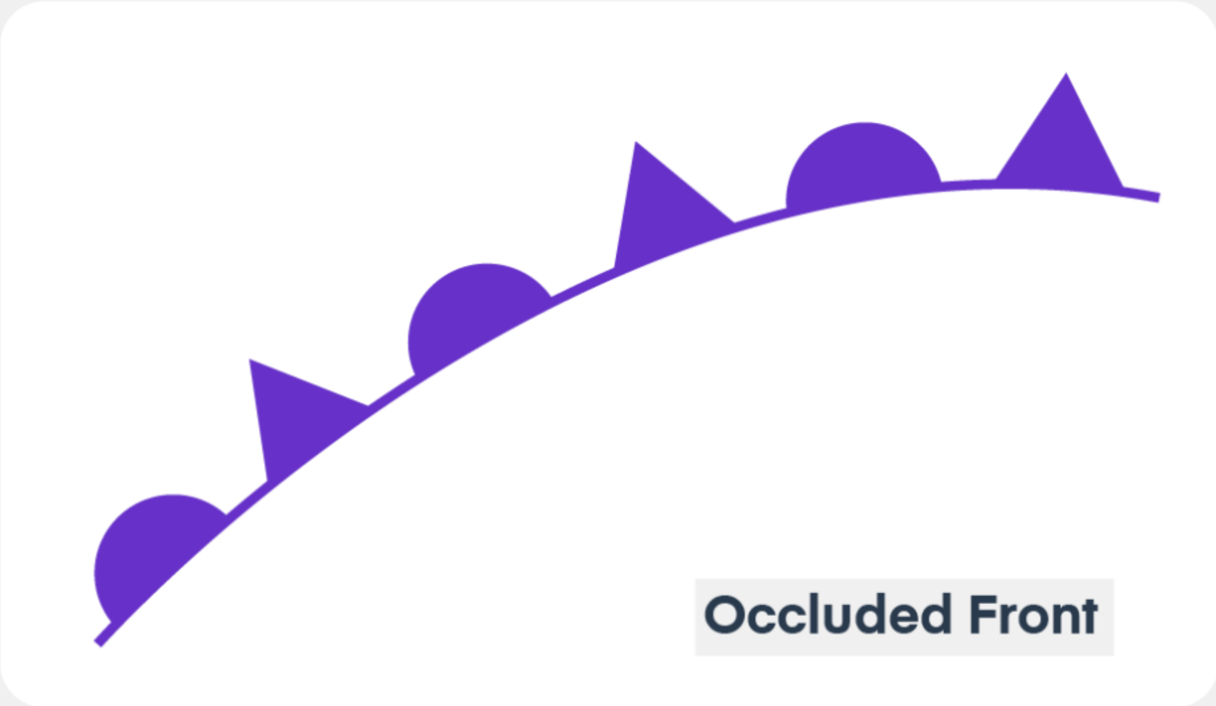


Stationary fronts exist where the forces pushing each air mass cancel each other out. Neither air mass can displace the other. The front remains suspended in one place for up to several days.

There's a sharp temperature contrast between the adjacent air masses, causing prolonged bad weather and rain.

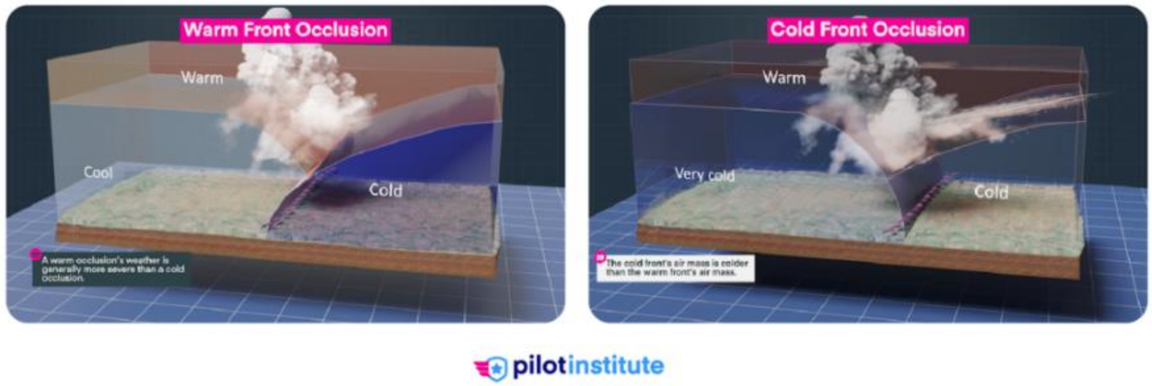
Stationary fronts feature alternating blue spikes and red semicircles in opposite directions.

Occluded Fronts



An occluded front forms when a cold front and a warm front travel in the same direction. The cold front, being faster, catches up to the warm front and overtakes it. This leads to the warm air mass lifting off the ground.

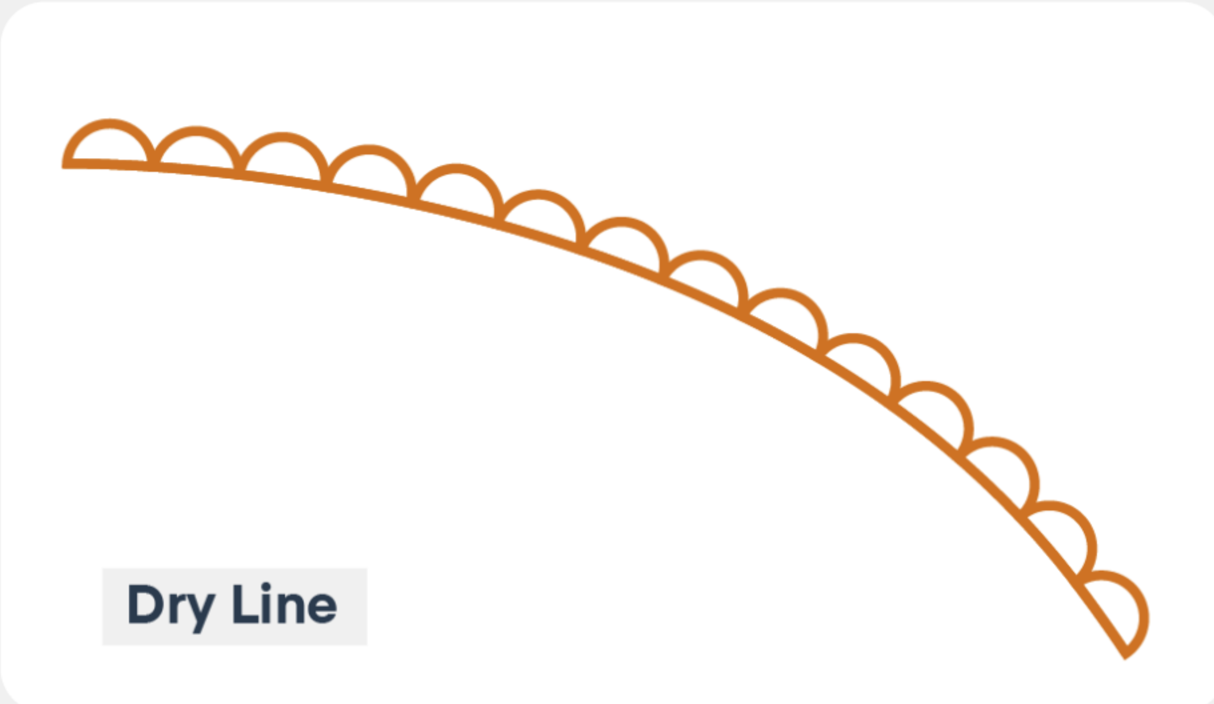
If the cold front is colder than the air ahead of the warm front, the cold front slides downwards and lifts the warm front aloft. This is called a cold front occlusion and is the most common type of occluded front. Cold occlusions generally cause heavy rainfall.



Alternatively, if the cold front is *not* colder than the air ahead of the warm front, we end up with a warm front occlusion. In this case, the cold front slides between the warm front and the cold air ahead. Warm occlusions show a more gradual weather change but lead to prolonged periods of rain.

Both types of occlusions appear as a purple line with alternating spikes and semicircles in the same direction.

Dry Line

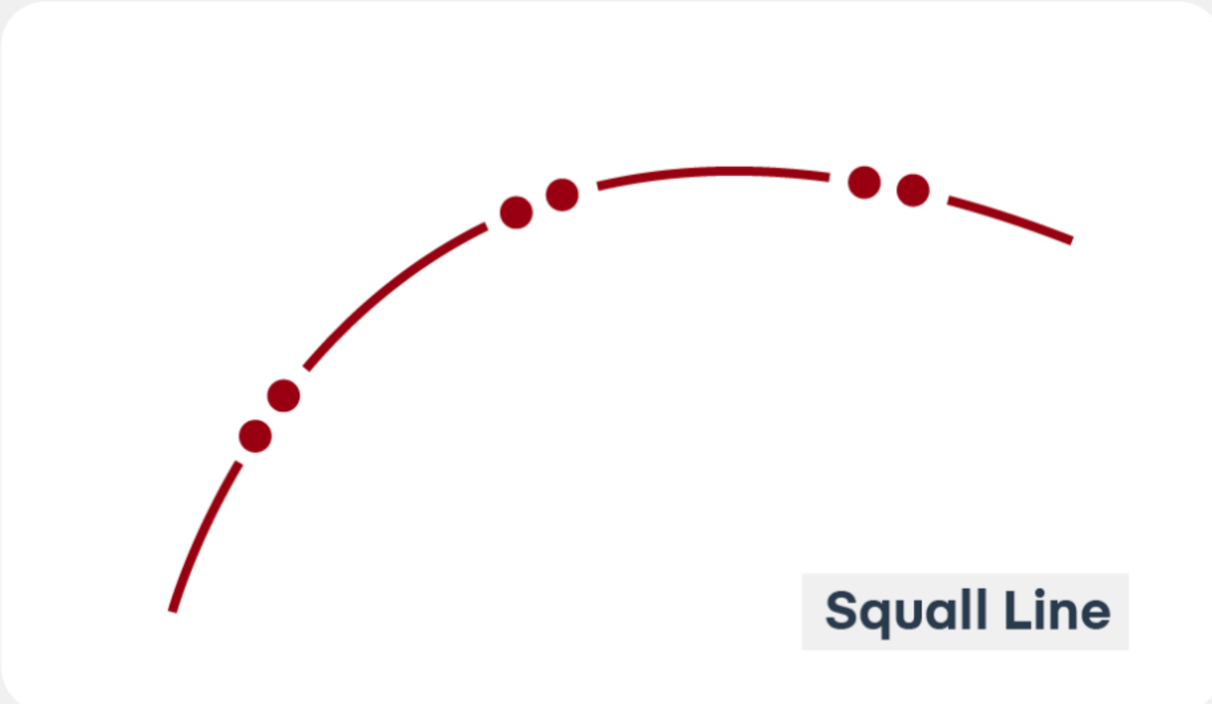


A dry line is a boundary separating a moist and a dry air mass. It's most common in spring and early summer and lies north-south in the central US states.

The moist air mass is usually on the east side, bringing moist air from the Gulf of Mexico. The dry desert air comes from the west side.

Dry lines appear as brown lines with scallops facing the moist air mass. Pilots try to avoid them, as they can trigger severe weather

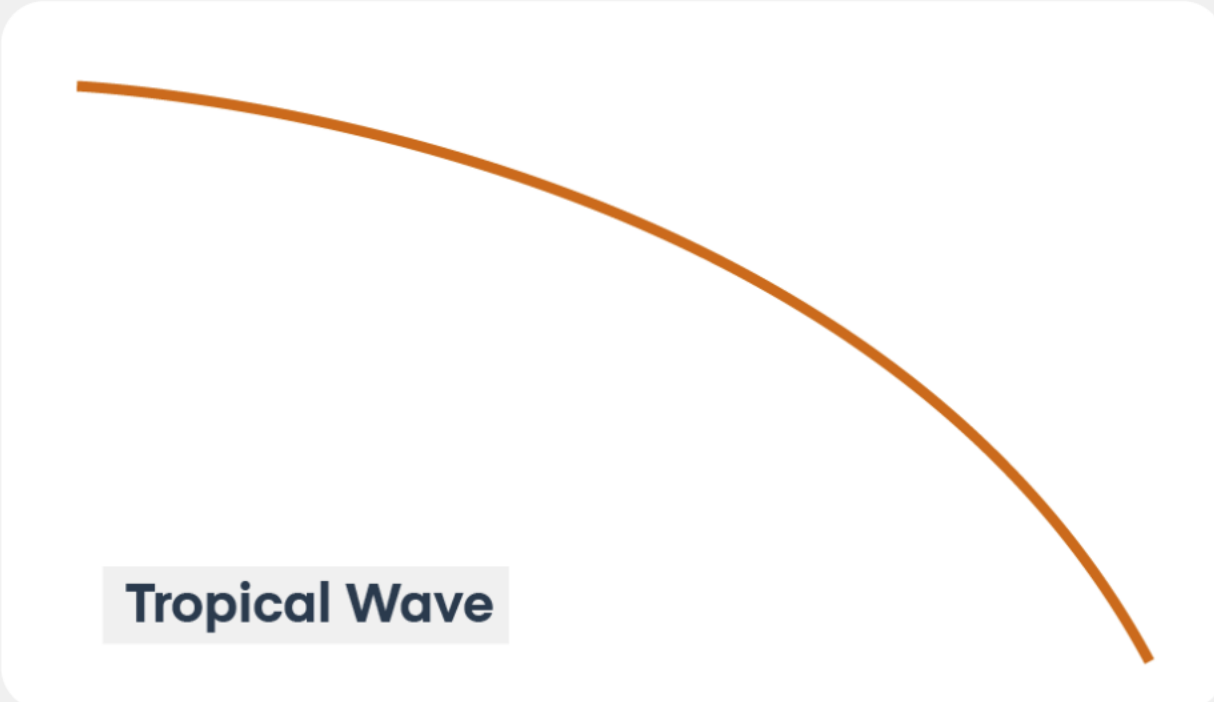
Squall Line



Squall lines represent a continuous line of thunderstorms. They usually occur near severe pressure fluctuations, often just ahead of cold fronts. Squall lines can travel at a speed of 25 to 50 miles per hour or more.

They're drawn as a pattern of two red dots and two dashes.

Tropical Wave



Trade wind easterlies are surface winds near the equator that blow east to west. Tropical waves are troughs within these winds that can develop thunderstorms and even tropical cyclones.

Given their unstable nature, pilots keep well away from them.

On the surface analysis chart, they're shown with a curved orange line with the label 'TRPCL WAVE.'

Frontogenesis (Initial Front Formation)

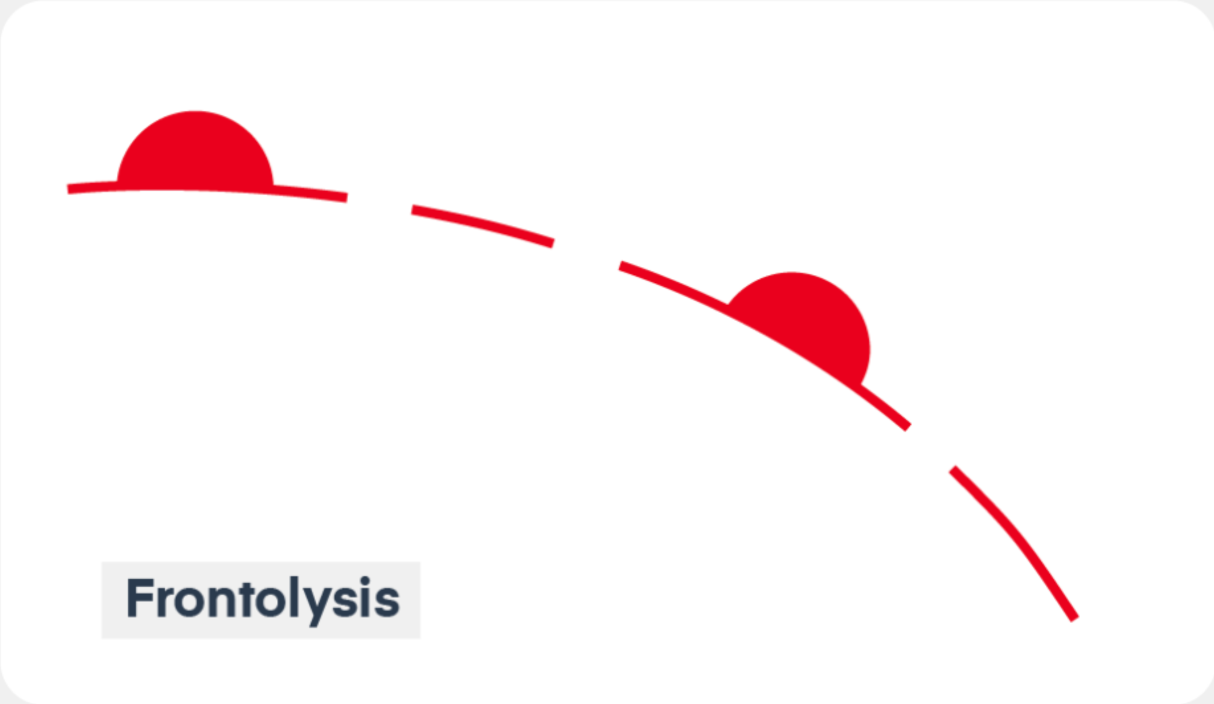
As fronts generally bring bad weather, pilots need to know whether the front is in its initial formation stage or is weakening and is about to dissipate.

Frontogenesis is the initial formation of a frontal zone. Surface analysis charts show it by breaking up the front line into dashes. Every single segment has the symbols of spikes or semi-circles representing the type of front.

If a chart shows frontogenesis, pilots can expect that front to grow stronger with rapid and significant weather changes. They might need to adjust their route around the front or consider diversions to alternate airports

Frontolysis (Front Dissipation)

Frontolysis is the dissipation of a frontal zone. This stage is also represented with a dashed line, but the frontal type symbol is only drawn on every other segment.



Frontolysis on a surface analysis chart indicates that the front could dissipate soon. Expect the adverse weather to clear up and stable atmospheric conditions to follow.

Conclusion

Understanding the weather is always complex. Pilots try to use as many sources of weather information as possible to improve their safety in the air.
After using the surface analysis chart for initial flight planning, the next step involves reading METARs and TAFs. Learn how to read them here.