Blocking Patterns

It's not something you do. Instead, this broad view of weather broadens IFR planning ability.

by Scott C. Dennstaedt

Consider two scenarios: Cold fronts zip through the area, leaving a path of devastation from thunderstorms, tornadoes, hail, and torrential rains. You sweat a few hours of intense weather and are rewarded with a couple days of blue skies as a ridge of cooler and dryer air mass settled into your area.

The second situation presents day after day after day of low ceilings, crummy visibility, drizzle and drenching rainfall. Turn down the temps a bit and now you can throw in the potential for icing. This is common to what's called a blocking pattern. No ridge moves in behind it.

Blocking weather patterns aren't too common, but whenever they occur they can be memorable by overstaying their welcome. Blocking can happen any time of the year bringing flooding rains, heavy snowfall, or drought conditions to a large portion of the country lingering for days or even weeks.

Not On The Surface

The telltale signs of a blocking pattern don't directly manifest themselves on the familiar surface analysis chart. However, it becomes crystal clear at FL180 that you're dealing with a blocking ridge and trough pattern by taking a peek at the 500-millibar constant pressure chart.

Normally at 18,000 feet ridges (areas of elongated high pressure) and troughs (areas of elongated low pressure) can be seen ushering in new air masses on a regular basis as they truck across the country. But for some unknown reason the ridge-trough pattern comes to a screeching halt and parks itself in one place for weeks at a time. For those under the ridge, this equates to clear, dry and warmer conditions and for those under the trough, this equates to cloudy, wet and cooler conditions. In the extreme cases, drought and flooding will occur, respectively.

> *"Blocking can happen any time of the year bringing flooding rains, heavy snowfall, or drought."*

Stationary Yes, Inactive No

In the mid-latitudes moving air masses make our weather changeable. When these air masses become stationary, the general weather we experience at the surface doesn't change from day to day. Even though the blocking pattern is stationary, this does not imply inactivity.

Short wave disturbances (areas of lowered pressure) form on the boundary of the main trough. These areas of energy are mere blemishes when depicted on the surface analysis chart. This leaves the little disturbances to flow along the pattern – like a train on its tracks – while the overall pattern remains fixed. However, it is not unusual for the blocking pattern to meander ever so slightly to the east or even to retrograde a slight bit to the west.

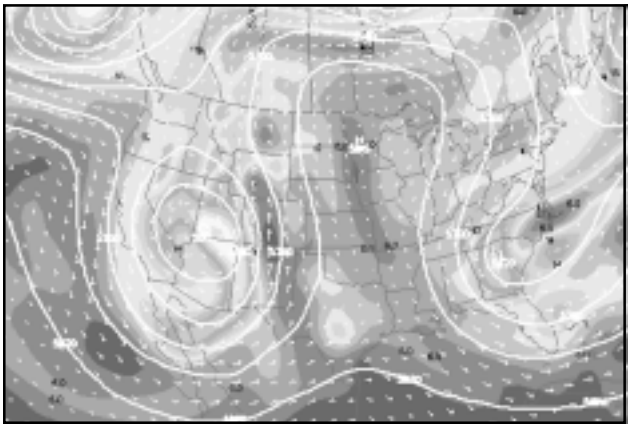
You can think of the trough (U-shaped contours) and ridge (inverted U-shaped contours) as cold and warm air, respectively. Colder air lives in the area under the trough and warmer air lives under the ridge. The tight sine wave gradient in the contours you see on the 500-millibar chart signifies the separation between the air masses. The area around the edge of the trough including the area between the ridge and the trough normally suffers from the worse weather. That's not to say that the area in the middle of the trough is rain or cloud free – it often isn't.

The Rex And The Omega

The last time I counted, forecasters have described five different blocking patterns. The two that are represented here are the omega block and the rex block. The omega block is named according to the shape it makes on the 500-millibar constant pressure chart. The ridge-trough pattern of the contours resembles the Greek letter omega. It has two large troughs on either side of a large blocking ridge.

Picture a backwards S, and you'll be able to immediately pick out a rex block on the 500-millibar chart. A strong high-pressure ridge adjacent to a strong low-pressure trough is the clue that you are experiencing a rex block. In most cases, the large ridge is oriented to the northwest of the large trough in a semi-tilted fashion.

The net effect of either blocking pattern is that air must flow far north



Left: *Contours seen in this 500-millibar constant pressure chart resemble the Greek letter omega. The trough-ridge-trough pattern is called the Omega block.*

before plunging far south as it follows the 500-millibar pattern. The wind flow makes little progress eastward as it swings around the trough and returns to approximately the same longitude.

During the last half of May we were treated to a long-lived rex block over much of the continental US. For the VFR pilot, a blocking pattern such as this can result in being grounded for days at a time with low ceilings and reduced visibility. This may not be as critical for the instrument rated pilot unless the pattern is anchored in place during the winter months effectively grounding everybody that doesn't have ice protection.

Insult To Injury

Some forecasters might argue that a blocking scenario makes the forecast much easier. I agree that isolating where it *will* likely rain and where it *will* likely be dry is certainly a no-brainer. However, pilots don't need to know if they should bring their umbrella with them. The forecast that pilots require demands a wee bit more detail.

Due to the variability of the day-to-day weather pattern, it's common for both long-range and short-range forecasts to become highly reliable in some locations and quite unreliable for locations in and around the trough. Computer forecasting models have a difficult time picking out the small ebbs and flows in the atmosphere that accompany this regime. Persistence becomes a good forecasting tool, but will a forecaster be willing to adopt

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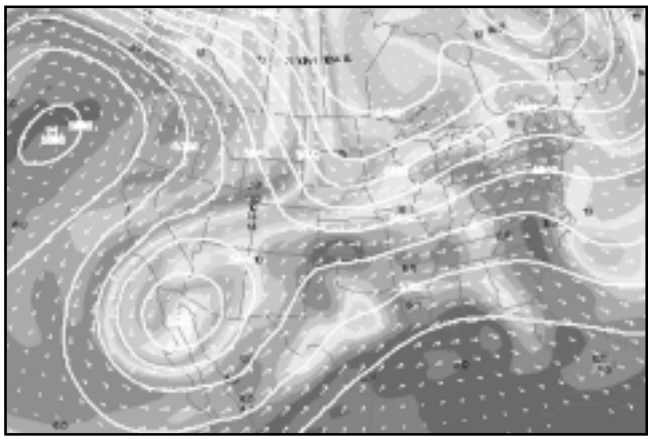

Above: *The backward S pattern in the contours on the 500-millibar constant pressure chart are a dead giveaway for the Rex block, named after the individual that discovered it.*

Forecasters Can Barely Keep Up With The Amendments

Area forecasts (FAs) and terminal area forecasts (TAFs) can become quite erratic during an episode of a blocking pattern. Amended forecasts can become the norm. This can be seen by a TAF issued for KBWI (Baltimore, Maryland) during the blocking episode in May 2003. 0000 UTC scheduled TAF: KBWI 242321Z 250024 VRB03KT P6SM SCT015 OVC035 BECMG 0305 VRB03KT 5SM BR BKN035 FM0800…

This 0000 UTC terminal forecast was amended four times before the next scheduled forecast was due at 0600 UTC.

First amendment: KBWI 250108Z 250124 07006KT 5SM BR FEW011 SCT035 OVC050 BECMG 0406 VRB03KT 4SM BR BKN035 FM0800…

Second amendment: KBWI 250205Z 250224 10006KT 3SM BR BKN003 OVC030 FM0800…

More importantly, the prevailing forecast and first two amendments did not include a forecast for thunderstorms.

Eventually, Nexrad began to show signs of convective activity that, in turn, prompted the forecaster to amend the forecast yet a third time to include thunderstorms (TSRA).

Third amendment: KBWI 250243Z 250324 10006KT 3SM BR BKN003 OVC030 TEMPO 0406 2SM TSRA BKN003CB FM0800…

If that wasn't enough, the fourth amendment as well as the 0600 UTC scheduled TAF included a forecast for heavy rain and thunderstorms (+TSRA).

Fourth amendment: KBWI 250415Z 250424 12006KT 3SM BR OVC003 TEMPO 0406 2SM +TSRA BKN003CB FM0800…

Guess what? A line of heavy rain moved through the area at 0605 UTC, but no thunder was ever heard.

This was the 0600 UTC scheduled TAF: KBWI 250527Z 250606 12006KT 3SM BR OVC003 TEMPO 0607 1SM +TSRA BKN003CB FM0900…

Finally, the actual report or METAR: 0605 UTC METAR for KBWI: KBWI 250605Z 14011KT 3/4SM R10/2800VP6000FT +RA BR OVC004 15/14 A2997 RMK AO2.

My good friends at the Weather Forecast Office in Sterling, Virginia had a rough night indeed.

Below: *Forecasters crank out the TAF amendments.*

Ya Gotta Land

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Quiz Answers

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Blocking

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such a simple method? Those that don't will likely find themselves frequently amending their forecast.

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Anywhere Weather

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