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Tips from the pros on predicting snow

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PAT GREENHOUSE/GLOBE STAFF

Ipswich got over 20 inches during a February snow storm.

By Matt Rocheleau

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With Massachusetts in the middle of a warm spell that is expected to last through December, there's a question on many residents' minds, particularly after last year's brutal winter: When is the snow

going to arrive?

Meteorologists say it's a difficult job to make snowfall predictions weeks ahead of time.

For those of you who can't get enough of weather wonkery — here are some of the top factors that the professionals monitor when they try to look into the future.

El Niño Southern Oscillation, or ENSO

Many of the world's long-term weather patterns are influenced by sea surface temperatures in the equatorial Pacific Ocean.

Warmer than normal temperatures trigger a phenomenon called El Niño.

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El Niño's warming breezes give ski industry the blues

A strong El Niño is bringing warmer than normal temperatures — and with it, prospects for much less snow.

For New England, a strong El Niño during wintertime tends to generate more storms, but warmer temperatures mean less snowfall, experts said.

“Typically, with a strong El Niño, the polar jet stream gets pushed back up to the north and keeps the cold air way up into Canada,” said Brett Anderson, a senior meteorologist for AccuWeather.com.

Currently, we are in the midst of one of the strongest El Niño periods ever recorded, which forecasters say explains the unusually mild weather across New England in recent weeks.

Meteorologists expect the warm trend to continue through part of January this winter. However, the El Niño is expected to weaken, causing a shift to more seasonable average temperatures and snowfall once February rolls around.

Forecasters tend to have more confidence on the impact of various climate patterns — including ENSO — the stronger they are.

“This year in particular, El Niño is so strong that it’s an overriding factor over everything else,” said Dan Leonard, senior meteorologist at Weather Services International in Andover.

To see the latest ENSO conditions, [click here](#).

North Atlantic Oscillation, or NAO

This phenomenon tends to have a strong influence on weather over the northeastern United States, as well as Greenland and Europe.

The NAO is the fluctuation between the sub-polar low near Greenland and Iceland and the subtropical high over the central north Atlantic Ocean. It’s measured by calculating the difference in the sea-level pressure between the two.

A negative NAO tends to generate colder, snowier winters for New England, while a positive one typically produces opposite results.

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One key difference to consider when looking at the NAO is that the pattern tends to change every few weeks, unlike ENSO patterns, which typically change more gradually.

“It has a tendency to change dramatically from one month to the next,” said Leonard.

To see the latest NAO conditions, [click here](#).

Arctic Oscillation, or AO

This climate index measures the state of atmospheric circulation over the Arctic.

A positive AO phase keeps the Arctic’s swirling cold air — known as a polar vortex — in place, while a negative phase allows the frigid air to sneak further south, sometimes reaching New England and other parts of the northern United States.

When the NAO is positive, the AO tends to be positive. The opposite is also true.

And, much like the NAO, the AO can change significantly every few weeks, limiting how far out forecasters can use it to make predictions.

“They really are not predictable beyond a few weeks and can’t be used to forecast a whole season at a time” said Jon Gottschalck, chief of the operational prediction branch at the National Weather Service’s Climate Prediction Center.

To see the latest AO conditions, [click here](#).

Other factors

So there are the basics. But the experts go even deeper.

While ENSO, the NAO, and the AO are typically viewed as the most helpful guides to long-range winter forecasting for New England, the experts say that they look at a wide number of factors and climate patterns to help them make their predictions.

“We kind of put it all together,” said Joseph D’Aleo, chief forecaster for WeatherBELL Analytics.

“Most people think El Niño and La Niña are the only factors, and they certainly play a big role, but there are many other factors we consider.”

Gottschalck said meteorologists get help from computer models that can make rough projections as far as several months out.

Other factors to consider, some of which are still being studied, include:

- The Atlantic Multidecadal Oscillation, or AMO, which considers sea surface temperature changes in the North Atlantic Ocean.
- The Pacific Decadal Oscillation, or PDO, which considers sea surface temperature changes in the northeast and tropical Pacific Ocean.
- The Quasi-Biennial Oscillation, or QBO, which considers the direction of winds in stratosphere along equator.
- The Pacific-North American Pattern, or PNA, which considers air pressure at four locations over the Pacific Ocean and North America.
- The Madden-Julian Oscillation considers changes in tropical weather patterns, primarily over the Indian and Pacific oceans.
- Siberian snow cover, particularly how much there is during the month of October, which is believed to influence winter weather in the Eastern United States.
- Solar activity, including sunspots, which can affect the weather on Earth. Even small changes the sun undergoes during its solar cycle can have effects here.

New research and improved technology have made long-range forecasting — including long-term predictions about New England snowfall — more accurate, forecasters say.

But it is still a significant challenge.

Snowfall totals are highly dependent on the precise track storms take and the temperatures when they hit. A slight change in a storm's direction and a shift of a few degrees here or there — above or below freezing — can be the difference between a blockbuster blizzard and a rainstorm.

Forecasting snowfall is difficult even just a day or two before a storm hits.

Leonard said that the goal for meteorologists making long-term snowfall predictions is to accurately forecast the general trend — for example, figuring out if snowfall will be above or below average.

“The goal here is to be directionally correct,” he said. “We’ve got to be on one side of normal.”

He said meteorologists are accurate making such broad forecasts about 60 to 65 percent of the time.

But, he said, being much more precise when predicting seasonal snowfall is “next to impossible.”

“Predicting snowfall, in my opinion, is never going to be very skillful when you’re making seasonal forecasts,” said Leonard.

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