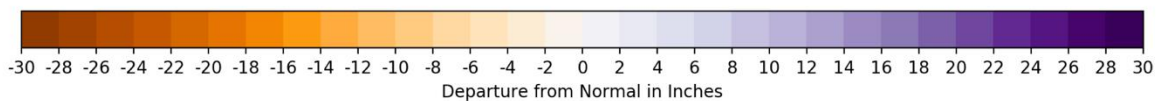
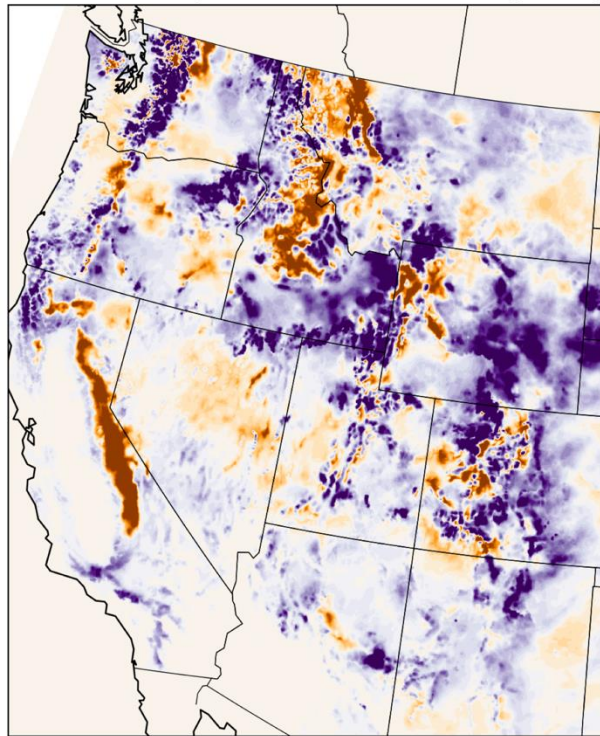


Northwest Summary & Outlook February 2020

Mid-winter Rebound

Split flow in the Gulf of Alaska has completely changed the snow cover in the Cascades and Northern Rockies. Most reporting stations are now 90+% of average, which dramatically reduces the probability of summer shortages in irrigation water. Northwest flow in the jet stream has frequently targeted western Washington and recently caused a lot of flooding; Seattle recorded 12.5 inches of rain since the start of 2020, which is a 6-inch surplus. This same jet stream pattern brought winds of 60-100 mph to parts of Montana on Feb. 1, and the ensuing dust storm was one of the strongest on record.

Accumulated Snowfall Departure from 2008-2018 Average through Feb 6



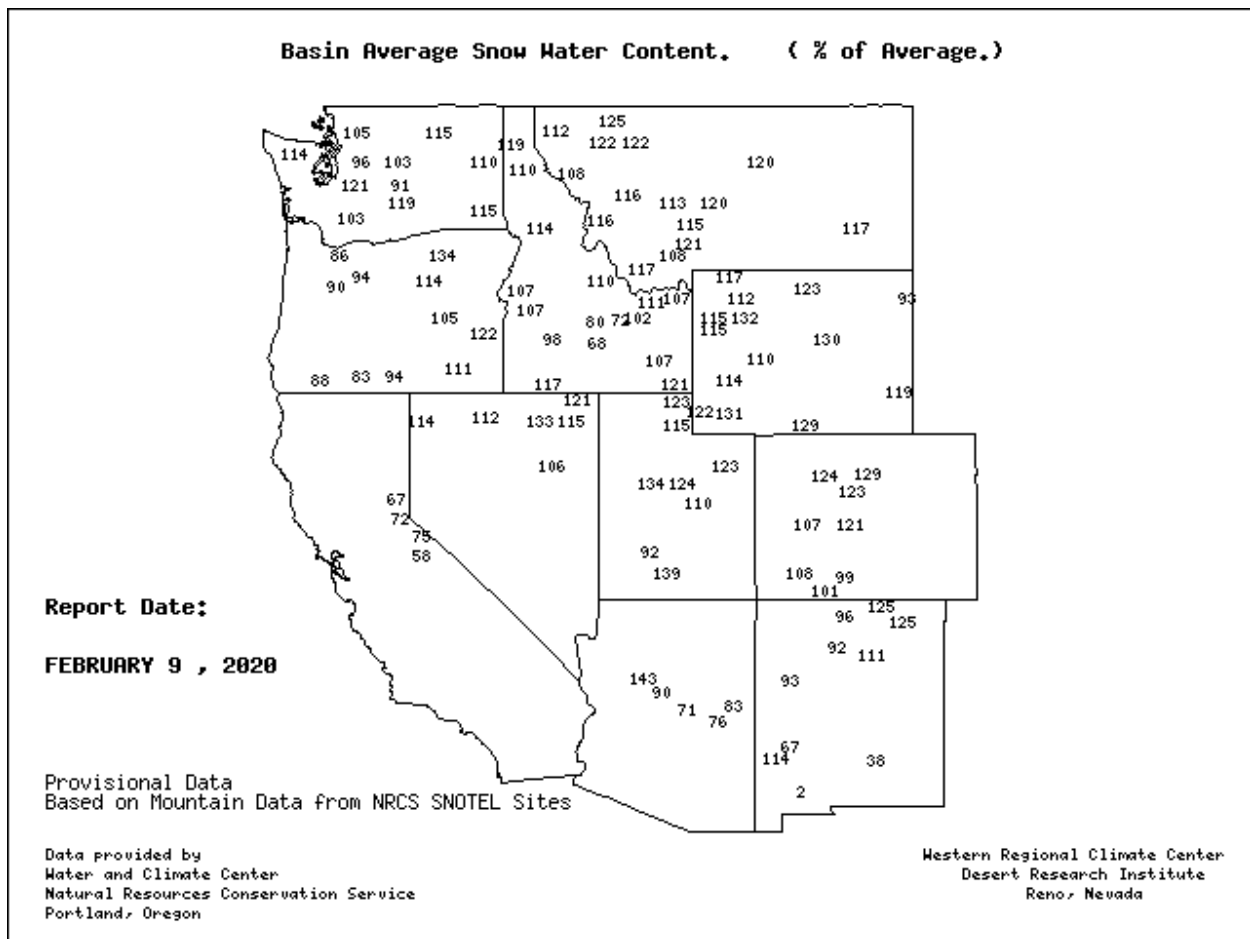


Figure 1. (top) Seasonal snowfall anomaly map through Feb. 6, 2020. Source: <https://www.nohrsc.noaa.gov/snowfall/> Created by Snodgrass. (bottom) Basin Average Snow Water Content through Feb. 9, 2020. Source: <https://wrcc.dri.edu/snotelanom/snotswen.gif>

February Outlook

Models have struggled to accurately forecast the precipitation patterns that are riding around the split flow in the Gulf of Alaska. Expect this to continue through February as a trough deepens over Alaska and increases the wind speed in the jet stream out of the northwest. This will subsequently target coastal Washington, the northern Cascades and northern Rockies with heavy rain and snow at times. Each day's rain/snow forecast will depend on the position of the surface high-pressure system off the coast of California (which will have a dry February adding to California's drought concerns). The farther south and west this high-pressure cell migrates, the wetter/snowier the conditions in the Pacific Northwest. I don't expect much precipitation through the rain shadow in the Columbia Basin as the jet stream flow will hit the Cascades in a perpendicular flow pattern, but the probability of finishing the wet season without enough mountain snow for spring and summer is very low. This flow pattern also favors a temperature pattern that avoids extreme cold or long durations of time of above normal temperatures.

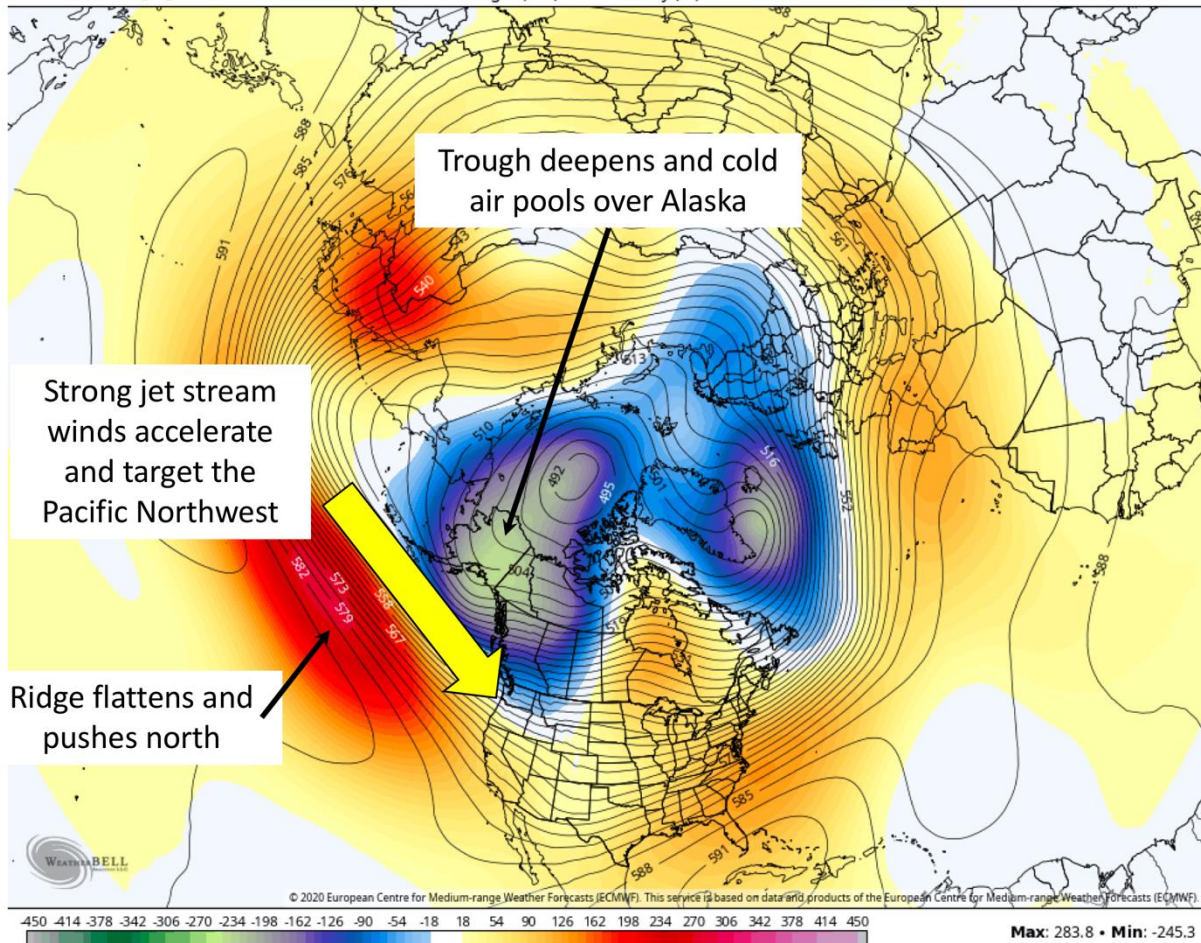


Figure 2. 500mb Geopotential high pattern on Feb. 20, 2020. Troughs are found in cooler colors, ridges are found in warmer colors. Source: ECMWF via weatherbell.com

Spring Outlook

New long-range analysis from the ECMWF (European Medium Range Forecast Model) and the seven models in the NMME (North American Multi-Model Ensemble) are showing strong bias toward persistence in the forecast for March-May. Temperatures are forecast to be close to normal with a potential for a warmer bias. Drier conditions around split flow in the Gulf of Alaska are forecast to stay there, giving most of the Pacific Northwest near average rainfall/snowfall to finish the wet season. Here is a rundown of the major players influencing the flow of the jet stream as we set up the pattern for spring.

1. El Niño/La Niña. There is no strong signal coming from this region of the tropics. Pressure patterns have occasionally led to brief westerly wind bursts (a signal for El Niño) but those have abruptly ended. Some long-range models have hinted at cooler water spreading west from the South American coastline so we need to watch this region for weak La Niña-like behavior during summer.
2. Greenland. This winter has sustained one of the longest-duration, positive-phase North Atlantic Oscillation patterns on record. This has helped keep the polar vortex in check all winter.
3. Polar vortex. We are running out of time for a stratospheric polar vortex disruption to have much of an effect on our weather patterns. Currently, both the Arctic oscillation and

stratospheric polar vortex remain positive and strong, which leads to more moderate temperatures.

4. Global winds. If there is a wild card in the long-range forecast, it is the strength of the global winds. For most of January, the global wind anomaly was positive, forcing the jet stream speeds around the planet to exhibit much-above-normal speeds. By mid-February, the global winds have calmed, which could influence the position of the jet stream split in the Gulf of Alaska. Watch it closely with me.

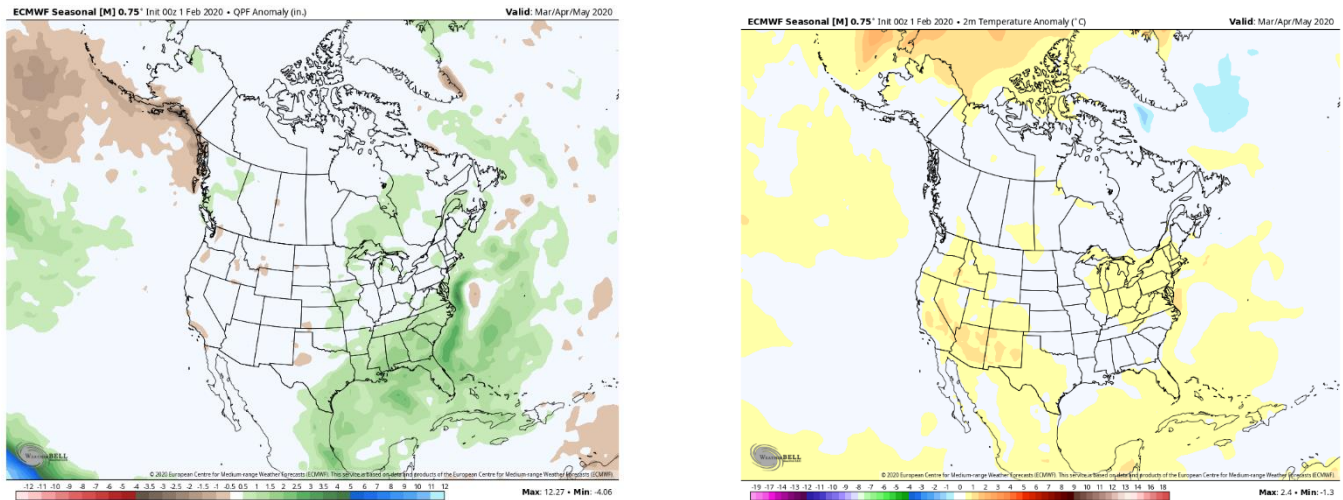


Figure 3. ECMWF temperature and precipitation anomaly forecast for March-April-May 2020. Source: ECMWF <https://maps.weatherbell.com/>