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26 March- Petropavlovsk-Kamchatsky and St. Paul Island

Big Picture

As with much of this winter, the Northern Hemisphere continues to be highly amplified even as the seasons begin to transition. Across the Pacific coast of North America, a high-latitude ridge has slowly been retrogressing from northern Canada into Alaska, becoming more anomalous as it does so. Along with that, several shortwave features across east Asia begin to phase a few days before the forecast period, leading to rapid cyclogenesis off the coast of Kamchatka. This intense cyclone will start the forecast period, forecasted to reach around 940 mb. An associated atmospheric river along the eastern edge of the cyclone will bring anomalous moisture into the Arctic through the Bering Strait. This diabatic heat release, along with negative PV advection, will act to reinforce this prominent Rex block across Alaska and the central Pacific. By days 1 and 2, other shortwave features begin to phase in a similar area and develop into a very deep cyclone. However, with the first cyclone shifting the jet to a north-south orientation, the cyclone is more or less stationary as it is not able to traverse over the blocking ridge in Alaska. As the block slowly continues to retrogress, repeated cold surges from east Asia continue to dive down in between the Alaskan and central Asian blocks, aiding in similar cyclogenesis as in earlier in the time period. Through the end of the period, this general pattern persists, with little indication of breakdown through day 10.

Day 7-10

With the block across Alaska slowly drifting further west, there is little change in the large-scale flow pattern. As cold surges come off of eastern Siberia, the troughs have no way of “riding the ridge”, so these features must dive further south, aided in part by an anomalously extended North Pacific jet. This is evident on the dynamic tropopause, with PV streamers forming on the western edge of the ridge and eventually becoming disconnected with their source region over Siberia. Toward days 9 and 10, two of these surface cyclones look to merge together and form an even deeper cyclone around 40 N, a very low latitude for this time of year. Whether this cyclone can actually impact the west coast of North America is still unclear, but should be far removed from either of the forecast cities.

Day 4-6

A poleward meridional, upper-tropospheric PV gradient is enhanced by a slow moving, west Pacific surface cyclone that induces anticyclonic wave breaking centered over Alaska due to diabatically assisted ridge amplification. Consequently, high PV air is advected into a PV streamer upstream of a persistent east Pacific ridge that submerges

underneath the ridge, reinforces a Rex pattern and anchors the ridge by the end of the period. A quasi-stationary surface cyclone east of the Kamchatka Peninsula induces an easterly regime until day 5, optimizing orographically enhanced precipitation along with anomalous warm air advection. The aforementioned cyclone eventually becomes influenced by a newly formed surface cyclone originating from the East China Sea that moves into the poleward exit region of the north pacific jet by day 5, thereby strengthening and slowly steering poleward as it interacts with downstream blocking. An anomalous +2 sigma surface high pressure centered over Alaska will continue to persist throughout the period, producing a confluent region of east-southeasterly low-level winds acting to advect warm air into St. Paul Island.

Day 0-3

The period begins with a deep, surface cyclone that moves into Chukotka from the Bering Sea associated with an extended, equatorward shifted north Pacific jet. A sufficient amount of differential diabatic heating associated with latent heating contributed by the surface cyclone redistributes and lowers the upper-tropospheric PV, thus causing rapid genesis of an upper-tropospheric ridge in the east Pacific. As the surface cyclone moves poleward into the Chukchi Sea, the east Pacific ridge transforms from a omega block to a rex block feature by the end of day 1 due to simultaneous cyclonic wave breaking in the western Pacific and anticyclonic wave breaking in the east Pacifc. In the lower troposphere, a surface cyclone originating from the East China Sea associated with cyclonic wave breaking in the western Pacific will begin moving into Petropavlovsk-Kamchatsky and become quasi-stationary south of the region, inducing anomalously warm surface temperatures and wet conditions throughout the rest of the period. Further east, discontinuous ridge retrogression creates an anomalously warm and dry regime for much of Alaska and the Bering Sea after day 1.

Probabilistic Forecasts for the period

Petropavlovsk-Kamchatsky, Russia

Day 0-3

High Temperature	10th: 29°F	50th: 31°F	90th: 33°F
Low Temperature	10th: 20°F	50th: 23°F	90th: 26°F
Precipitation	10th: 0.10”	50th: 0.15”	90th: 0.25”

Day 4-6

High Temperature	10th: 31°F	50th: 33°F	90th: 35°F

Low Temperature 10th: 22°F 50th: 23°F 90th: 24°F
Precipitation 10th: 0.00” 50th: 0.05” 90th: 0.10”

Day 7-10

High Temperature 10th: 28°F 50th: 31°F 90th: 34°F
Low Temperature 10th: 22°F 50th: 24°F 90th: 26°F
Precipitation 10th: 0.15” 50th: 0.30” 90th: 0.60”

St. Paul Island, United States

Day 0-3

High Temperature 10th: 36°F 50th: 37°F 90th: 38°F
Low Temperature 10th: 32°F 50th: 33°F 90th: 34°F
Precipitation 10th: 0.05” 50th: 0.09” 90th: 0.13”

Day 4-6

High Temperature 10th: 37°F 50th: 38°F 90th: 39°F
Low Temperature 10th: 33°F 50th: 34°F 90th: 35°F
Precipitation 10th: 0.02” 50th: 0.04” 90th: 0.06”

Day 7-10

High Temperature 10th: 36°F 50th: 37°F 90th: 38°F
Low Temperature 10th: 31°F 50th: 32°F 90th: 34°F
Precipitation 10th: 0.00” 50th: 0.00” 90th: 0.02”