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28 March- Petropavlovsk-Kamchatsky and St. Paul Island

Big Picture

As forecasted on Tuesday, another anomalously deep cyclone is situated between the end of the Aleutian Islands and Kamchatka on day 0 of the forecast period. As this feature begins to dissipate through late in day 1 and 2, it will undergo cyclonic wave breaking and form a PV streamer on the southeastern edge of the storm. Eventually, this PV streamer will subduct under the blocking ridge and help to intensify the trough portion of this Rex block pattern that has been present in this area for over a week. With the cyclonic wave breaking early in the forecast, an essentially meridional upper-level flow pattern through the Bering Sea will help to advect anomalously warm and moist air into the Arctic, a potential issue in terms of rapid sea ice loss. Between days 5 and 7, this omega block makes a rather rapid jump from Alaska to northeastern Siberia as the jet doubles back on itself around 50N due to intense cyclonic wave breaking in the same region of interest. Because winds on the dynamic tropopause are stronger further south in connection with the jet, this forcing will act to bring the block further west much faster than it normally would from simple Rossby wave dynamics. By the end of the period, the broad area of anomalously low heights south of Kamchatka and to the east of Japan persists and the mean large-scale pattern remains stable.

Day 7-10

With the blocking ridge now over Siberia due to cyclonic wave breaking in days 4-6, Alaska for the first time in several weeks will have negative 500-mb height anomalies. However, these are more zonal height anomalies since the North Pacific jet is forecasted to become anomalously extended (up near 3 sigma) and strong, with very few meridional excursions and an overall equatorward shift. This creates a dipole pattern across eastern Siberia with the blocking at high latitudes near the Arctic coast and a persistent trough across northern Japan and west of Kamchatka. Overall, this pattern looks to remain in place through the end of the forecast period. Repeated cyclogenesis near the Kamchatka Peninsula will keep this region stormy and mostly above average as our forecast region will remain in the warm sector of these cyclones. Saint Paul Island and much of Alaska is expected to remain outside this storm track, and despite the anomalously low 500-mb heights moving in, above average temperatures expect along the Arctic coast.

Day 4-6

Two newly formed cyclones in the west and central Pacific along 40N form in tandem underneath the poleward exit region of a more extended upper-level jet. The western

Pacific cyclone will move poleward to 50N, southeast of the Kamchatka Peninsula by day 5 and induce anomalous precipitation and warm temperatures throughout the rest of the period. Consequently, diabatic forcing associated with both of the aforementioned surface cyclones and the anchoring of the east Pacific ridge as continuous 500-hPa troughs submerge underneath the feature allows a low PV streamer to extend from the western US to the Bering Sea. As a result, the persistent high pressure over Alaska breaks down by the end of the period, shifting west into Siberia in conjunction with induced precipitation for the Aleutian Islands.

Day 0-3

The period begins with an omega-like pattern over the east Pacific transitioning into a Rex-like pattern due to anticyclonic wave breaking at 60N in conjunction with cyclonic wave breaking further upstream in the central Pacific. An intense cyclone located on the poleward exit region of the North Pacific jet is centered southeast of the Kamchatka peninsula deepens by day 1, aiding in building the downstream ridge as signaled by the erosion of upper-level PV induced by diabatic heating and its redistribution by the associative irrotational flow. As the cyclone steers further poleward beyond the exit region of the jet, it becomes quasi-stationary throughout the rest of the period, inducing anomalously warm and wet conditions for Petropavlovsk-Kamchatsky due to continuous easterly flow in the lower troposphere. Further east, southerly flow associated with a meridionally oriented pressure gradient throughout the depth of the troposphere advects tropical originating air into the Aleutian Islands, enhancing precipitation in regions where instability is favored over cool SSTs in the Bering Sea.

that the details of microphysics can have a significant impact on the material change in PV, and thus potentially on the larger-scale circulation (*Hoskins et al.*, 1985).

Probabilistic Forecasts for the period

Petropavlovsk-Kamchatsky, Russia

Day 0-3

High Temperature	10th: 32°F	50th: 33°F	90th: 35°F
Low Temperature	10th: 21°F	50th: 23°F	90th: 24°F
Precipitation	10th: 0.20”	50th: 0.35”	90th: 0.45 ”

Day 4-6

High Temperature 10th: 31°F 50th: 33°F 90th: 35°F
Low Temperature 10th: 28°F 50th: 30°F 90th: 31°F
Precipitation 10th: 0.90” 50th: 1.30” 90th: 1.80 ”

Day 7-10

High Temperature 10th: 32°F 50th: 33°F 90th:35 °F
Low Temperature 10th: 28°F 50th: 30°F 90th: 32°F
Precipitation 10th: 0.60” 50th: 0.75” 90th: 1.00”

St. Paul Island, United States

Day 0-3

High Temperature 10th: 36°F 50th: 38°F 90th: 40°F
Low Temperature 10th: 33°F 50th: 34°F 90th: 35°F
Precipitation 10th: 0.00” 50th: 0.01” 90th: 0.02”

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: 0.00” 50th: 0.02” 90th: 0.04”

Day 7-10

High Temperature 10th: 34°F 50th: 36°F 90th: 38°F
Low Temperature 10th: 29°F 50th: 31°F 90th: 33°F
Precipitation 10th: 0.00” 50th: 0.00” 90th: 0.00”