Winter water formation due to sea ice production is examined in the Chukchi Sea for the winters of 1992-2006, where a primitive equation ocean model is forced by NCEP wind and surface salinity flux derived from SSM/I thin-ice thickness. The model is also forced by an external inflow of 0.8 Sv through the Bering Strait. The model successfully reproduces the oceanic circulation on the Chukchi shelf. Northeasterly wind that can promote the occurrence of the Barrow coastal polynya weakens the northward throughflow driven by the pressure-heading force. In other words, winters with strong northeasterly wind yield relatively small volume flux via the Barrow Canyon, where the salinity increase often reaches 1.5-2.0 psu at a maximum. On the other hand, for winters with weak northeasterly wind, a large amount of water tends to be exported, and it has salinity as low as 0.5 psu. The throughflow via the Herald Valley is distinctively different with that via the Barrow Canyon, which is less enhanced in salinity and less sensitive to the northeasterly wind. Together with moored salinity in the Bering Strait, the model results estimate the actual salinity to be 32.9±0.8 psu and 32.7±0.3 psu, respectively, for waters moving through the Barrow and Herald Canyons. Both estimates are lesser than the salinity of 33.1 psu, typically observed for the cold halostad layer in the Canada Basin, suggesting the importance of diapycnal mixing with saltier Atlantic-origin water.