A numerical model, the Parallel Ocean Program, with 0.25 degree horizontal, spatial resolution and 28 vertical levels is used to simulate the circulation of the North Pacific Ocean for the time period 1970 to 2006 (not including a ten year spin-up from rest). The model is forced with NCEP (National Centers for Environmental Prediction) winds, surface heat flux and atmospheric pressure. Spectral nudging is used so that model drift of the mean state over the time period of the simulation is prevented, while allowing for the prognostic evolution of the circulation at time scales that are not nudged. The simulation produces a series of zonal current bands in the northeast Pacific that are separated by 300-500 km, a distance consistent with the Rhines scale (the scale at which the 2-D turbulence cascade tends to be arrested). The observed southward shift in the North Pacific Current in 2002-2003, as calculated from scalar observations, is reproduced by the model but, according to the model, it may not be a shift so much as a change in the relative intensity of two zonal current bands. This banding at the Rhines scale suggests an influence from Rossby waves that are heavily affected by nonlinearities, and evidence is found in the model for Rossby-wave-like behaviour in the northeast Pacific, both for coastally-generated waves and for waves generated away from the coast by the local winds. The waves propagate westward at about 1 cm/s.