Summertime phytoplankton blooms in the oligotrophic North Pacific ocean are supported by \( \text{N}_2 \)-fixing organisms that relieve the system of nitrate limitation. Phosphate and iron, however, limit their growth and need to be supplied for these organisms to thrive. We analyse two recent blooms in the region whose differences provide insight into their possible formation mechanisms. In 2008, a typical late-summer bloom, with sporadic patches of higher chlorophyll concentration, occurred near the island chain and the subtropical front. In 2010, an unusually large, contiguous bloom was observed in the western oligotrophic North Pacific, a region where blooms seldom, if ever, occur. Streaks of high chlorophyll in 2008 coincide with surface temperature fronts and regions of large horizontal stretching, as detected by Lagrangian diagnostics. Such regions are prone to the generation of vertical velocities via frontogenesis. Horizontal transport from upwelling regions or iron-rich island sediments is also important to the redistribution of nutrients. In the case of the 2010 bloom, we use a global aerosol transport model as well as spaceborne lidar observations to argue that atmospheric dust deposition events prior to the bloom provided the necessary nutrient conditions for the growth of \( \text{N}_2 \)-fixing organisms. As SST increased in the region, chlorophyll values increased significantly, showing that this bloom was likely a consequence of prior enrichment and that temperature is a key factor in bloom development in this important biome.