

7.2 Coastal Fog

Coastal fog is a cloud that reaches the land or ocean surface and develops through complex oceanic and atmospheric interactions (Clemesha et al., 2017; Koračin et al., 2014). Coastal fog forms on the western edges of many continents when offshore stratocumulus cloud decks, sustained by cool, moist marine air trapped beneath warmer, drier air, lower towards the ground (Pilié et al., 1979). As coastal fog moves inland from the ocean into coastal California, it provides moisture and shade (Clemesha et al. 2016; Torregrosa et al., 2014; USGS, 2022) and moderates coastal spring and summer temperatures, helping limit periods of unusually high daytime temperatures along the coast (Clemesha et al., 2018; Iacobellis and Cayan, 2013). Anomalously warm coastal land conditions are associated with reduced wind speeds, reduced cloudiness, and warmer sea surface temperatures in the Pacific Ocean (Hale et al., 2024). The importance of fog to California's water balance, energy demand, ecosystems, and human health is receiving increased attention among researchers (Burns, 2017; McLaughlin et al., 2017; Richter, 2026; Torregrosa et al., 2014). Improved understanding of climate change impacts on future fog trends may help researchers and resource managers better anticipate changes in water availability, coastal ecosystem function, energy use, and human exposure to heat.

Data on observed and projected changes to coastal fog linked to climate change in California remains limited, in part because long-term trends of coastal fog in California vary by location, period, and observing method (Werner et al., 2022; Williams et al., 2015), likely reflecting both large natural variability and the many interacting processes that influence coastal fog and low cloudiness (Clemesha et al., 2016, 2017, and 2023; Johnstone and Dawson, 2010; Koračin et al., 2014; Torregrosa et al., 2016). For example, decreases in coastal fog may be linked to increases in sea surface water temperatures. On the other hand, as the land surface warms faster than the ocean, the temperature difference may ultimately lead to increases in coastal fog (Ortiz, 2025). Human-caused global warming may be further altering the many processes that influence fog and low clouds, but the direction and magnitude of future changes along the California coast remain uncertain.



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