Analyses of MODIS Aqua data reveal that cloud trails 100 km or longer form in the lee of the Hawaiian Islands during the afternoon and dissipate during the night. Shown here are results for Kauai (1.5 km tall) and Oahu (1.2 km tall). Solutions to a mesoscale, atmospheric model applied to Kauai suggest that as solar radiation heats the island during the morning, warmer air is advected downstream, increasing air temperature and decreasing air pressure in the island’s wake. These changes induce low-level wind convergence (left panel), favoring the formation of afternoon clouds.

Trail clouds are commonly observed in the lee of islands, but this analysis shows that island thermal effects are important enough to suppress the trail clouds at night. The study is also significant in its combined use of satellite measurements and numerical modeling to understand detailed aspects of cloud formation.