Figure S1. CFSv2 250 hPa winds (barbs, knots), 250 hPa wind magnitude (shaded; m s^{-1}) and 250 hPa geopotential height (white contours; m) at 6-hourly timesteps between 4 March 2019 18 UTC and 6 March 2019 18 UTC.
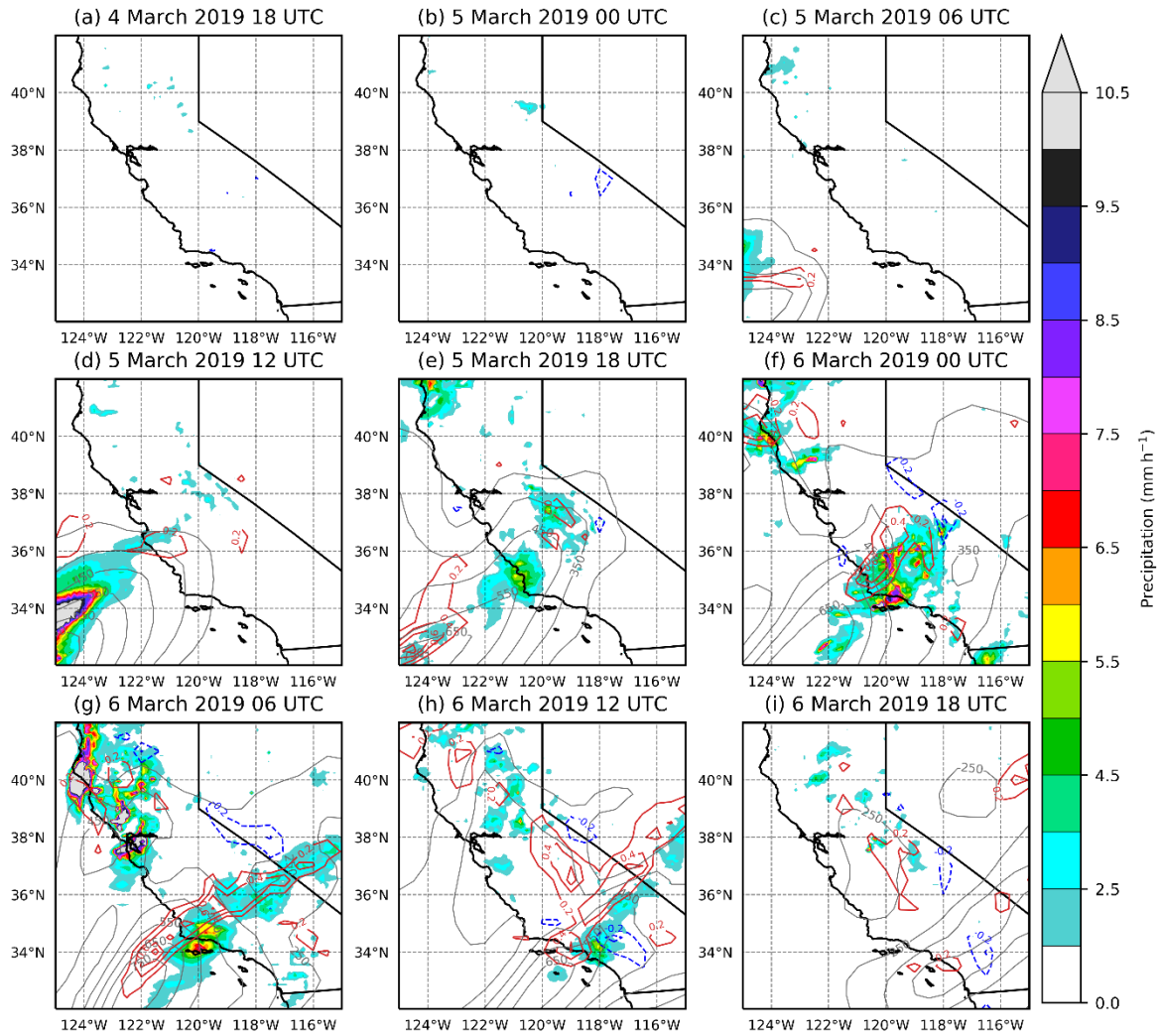
Figure S2. CFSv2 vertical velocity (red and blue contours, m s⁻¹), GPM averaged precipitation rate (shaded; mm h⁻¹), and IVT greater than 250 kg m⁻¹ s⁻¹ (grey contours; every 100 kg m⁻¹ s⁻¹) at 6-hourly timesteps between 4 March 2019 18 UTC and 6 March 2019 18 UTC.
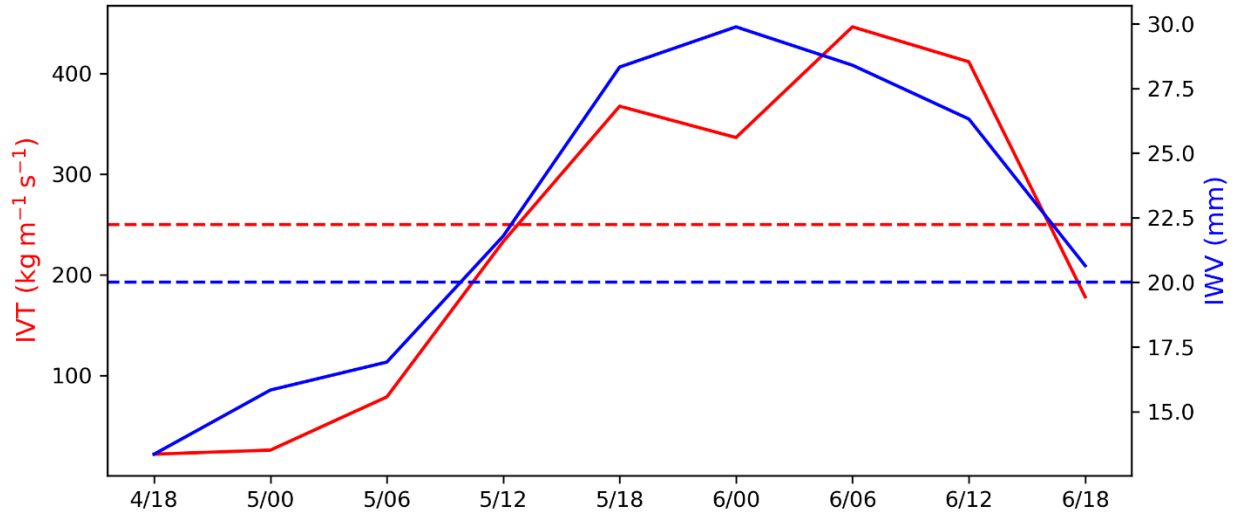
Figure S3. CFSv2 IVT (red line; kg m^{-1} s^{-1}) and IWV (blue line; mm) at the grid cell closest to Santa Barbara (34.5°N, 119.5°W) at each 6-hour time step between 4 March 2019 18 UTC and 6 March 2019 18 UTC. The minimum thresholds for the location to be considered part of an AR event are indicated by the dotted lines.
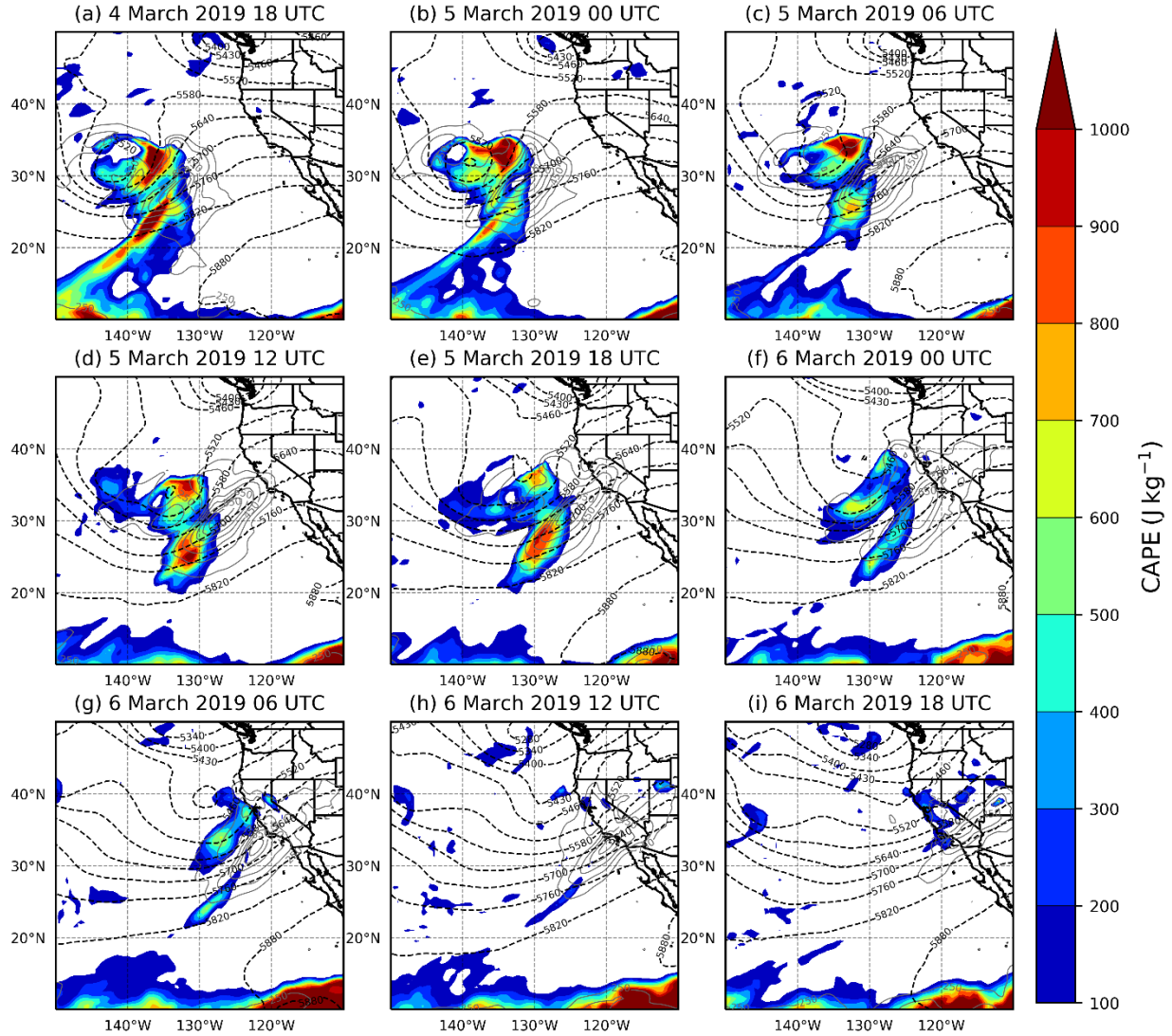
Figure S4. CFSv2 CAPE (shaded, J kg⁻¹), IVT greater than 250 kg m⁻¹ s⁻¹ (grey contours; every 100 kg m⁻¹ s⁻¹), and 500 hPa geopotential height (black dashed contours; m) for each 6-hour time step between 4 March 2019 18 UTC and 6 March 2019 18 UTC.
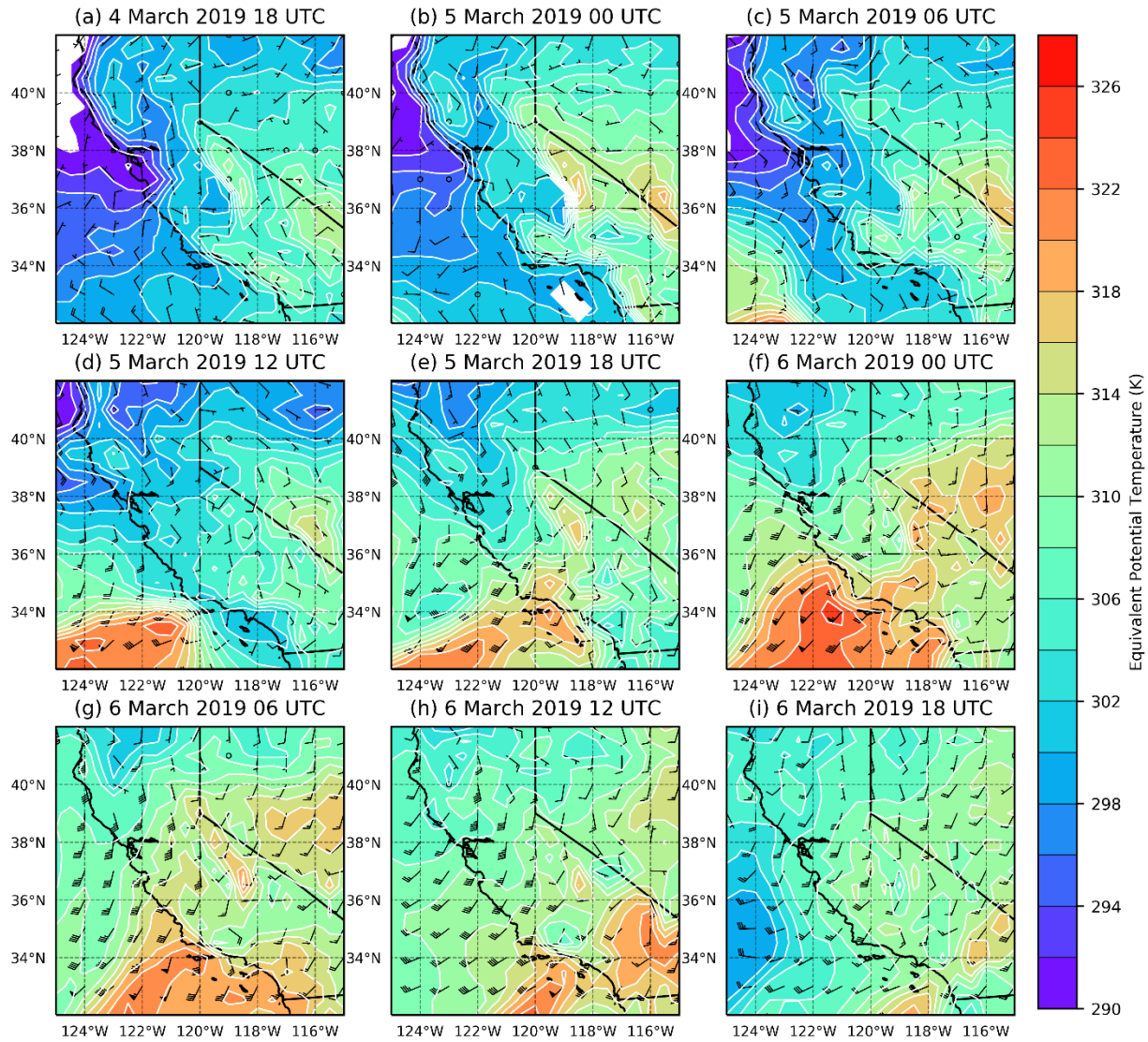
Figure S5. CFSv2 850 hPa Equivalent Potential Temperature (shaded and white contours to emphasize regions with strong gradients; K), and 850 hPa winds (barbs; knots) for each 6-hour time step between 4 March 2019 18 UTC and 6 March 2019 18 UTC.

Figure S6. Infrared brightness temperatures (shaded, °C) derived from band 13 of the GOES17 ABI L2 Cloud and Moisture Imagery Brightness Temperature at 6 March 2019 4:24 UTC.
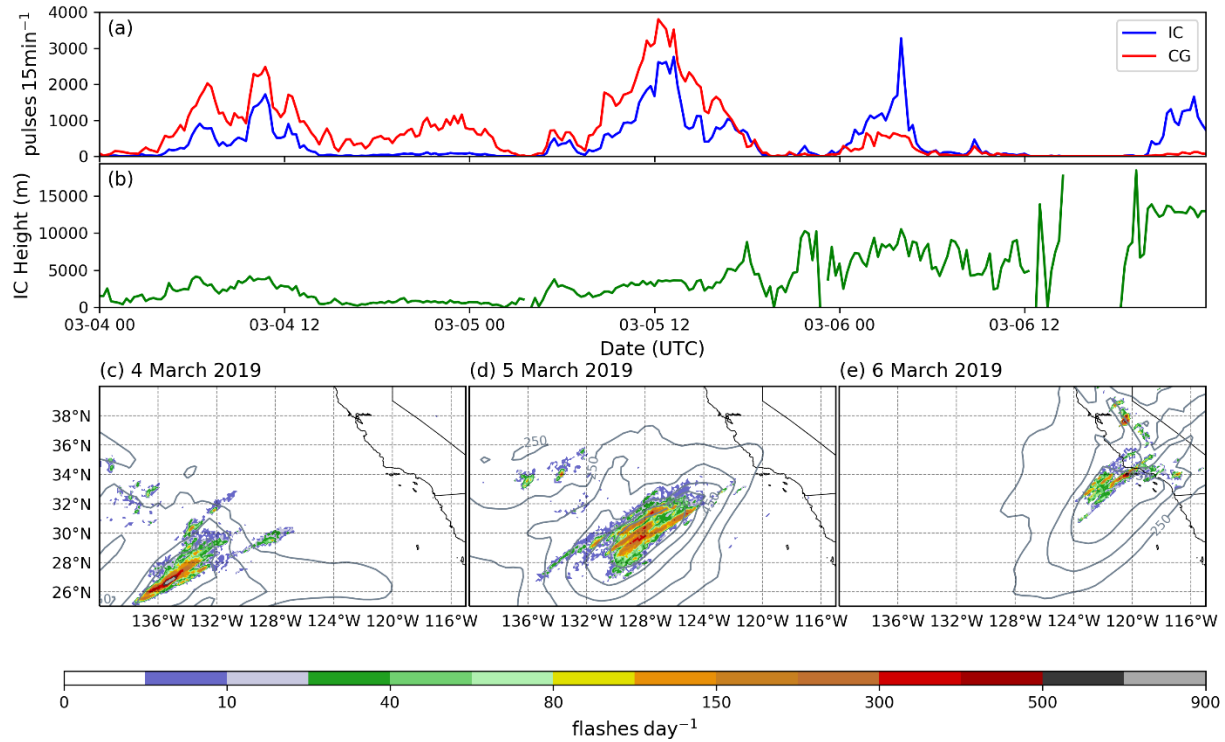
Figure S7. (a) ENGLN number of flashes per 15 minutes between 4 March 2019 00 UTC and 7 March 00 UTC for in-cloud (IC) flashes (blue line) and cloud-to-ground (CG) flashes (red line). (b) ENGLN average IC lightning flash height (green line; m) between 4 March 2019 00 UTC and 7 March 00 UTC. (c) ENGLN lightning flash count (shaded, flashes day^{-1}) interpolated to 0.1º and IVT greater than 250 kg m^{-1} s^{-1} (grey contours; every 100 kg m^{-1} s^{-1}) for the 24-hour period of 4 March 2019. (d) Same as (c), but for the 24-hour period of 5 March 2019. (e) Same as (c), but for the 24-hour period of 6 March 2019.
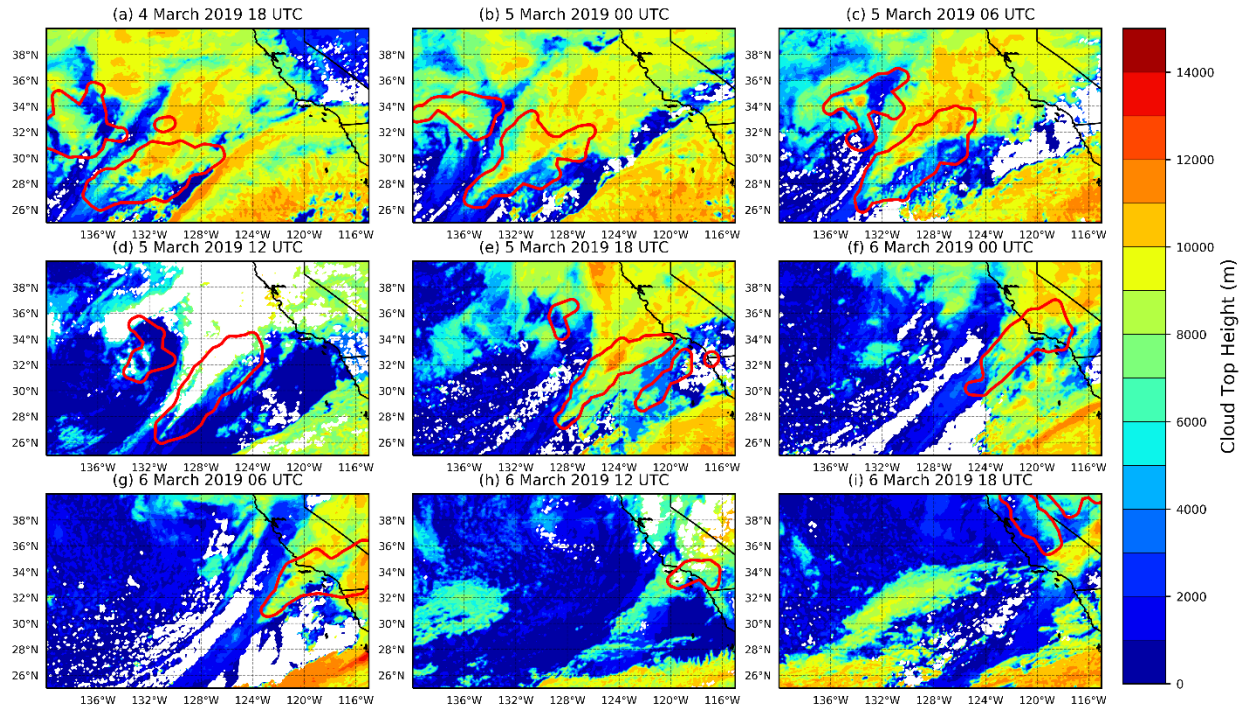
Figure S8. GOES ABI L2 ACHC cloud top height (shaded; m) and the location of the majority of lightning flash points (red polygon) at each 6-hour time step between 4 March 2019 18 UTC and 6 March 2019 18 UTC.
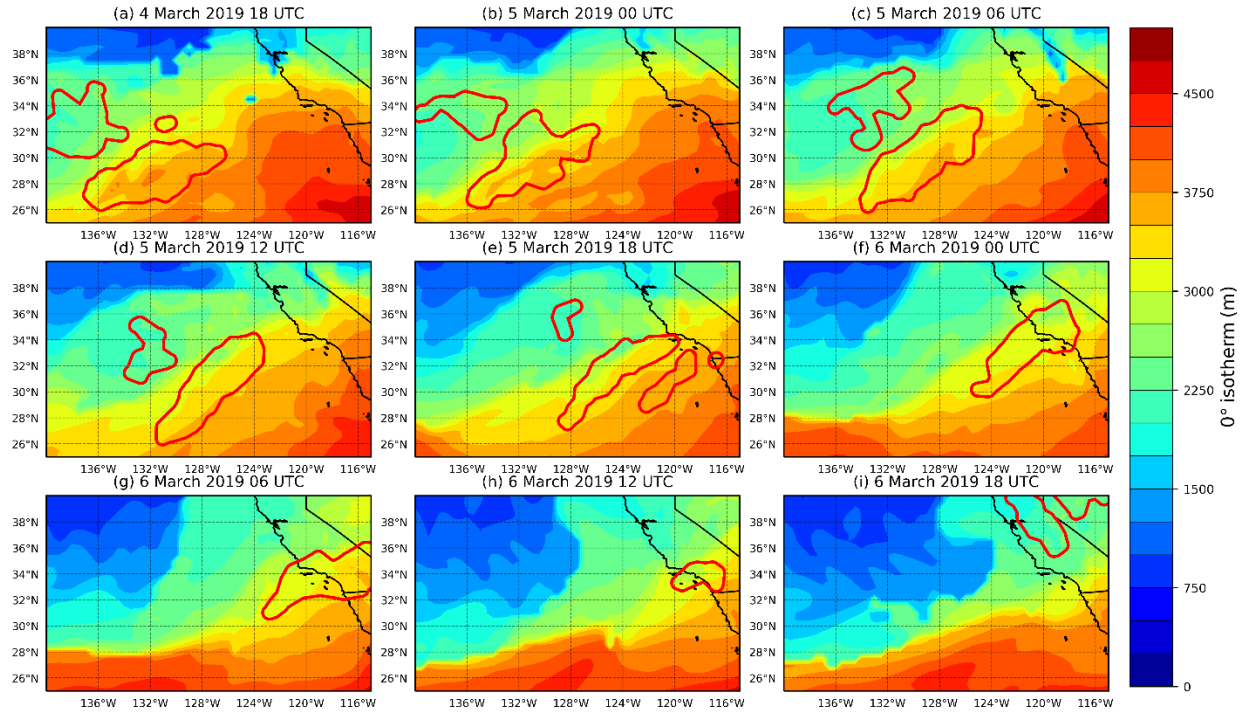
Figure S9. CFSv2 height of 0⁰ isotherm (shaded; m) and the location of the majority of lightning flash points (red polygon) at each 6-hour time step between 4 March 2019 18 UTC and 6 March 2019 18 UTC.