## Supplementary Material to

## D. N. Bernstein, J. D. Neelin, Q. B. Li, D. Chen: Could aerosol emissions be used for regional heat wave mitigation? *Atmos. Chem. Phys.*, submitted.

The California heat wave of July 22-23 2006 is used as an example of background state in which to carry out the sensitivity experiments described in the main text. Here, reanalysis results are provided for reference of the estimated surface temperature and upper-level flow fields occurring at that time. The North American Regional Reanalysis (NARR) data set was obtained from the Research Data Archive (RDA) which is maintained by the Computational and Information Systems Laboratory (CISL) at the National Center for Atmospheric Research (NCAR). The original data are available from the RDA (http://dss.ucar.edu) in dataset number ds608.0.

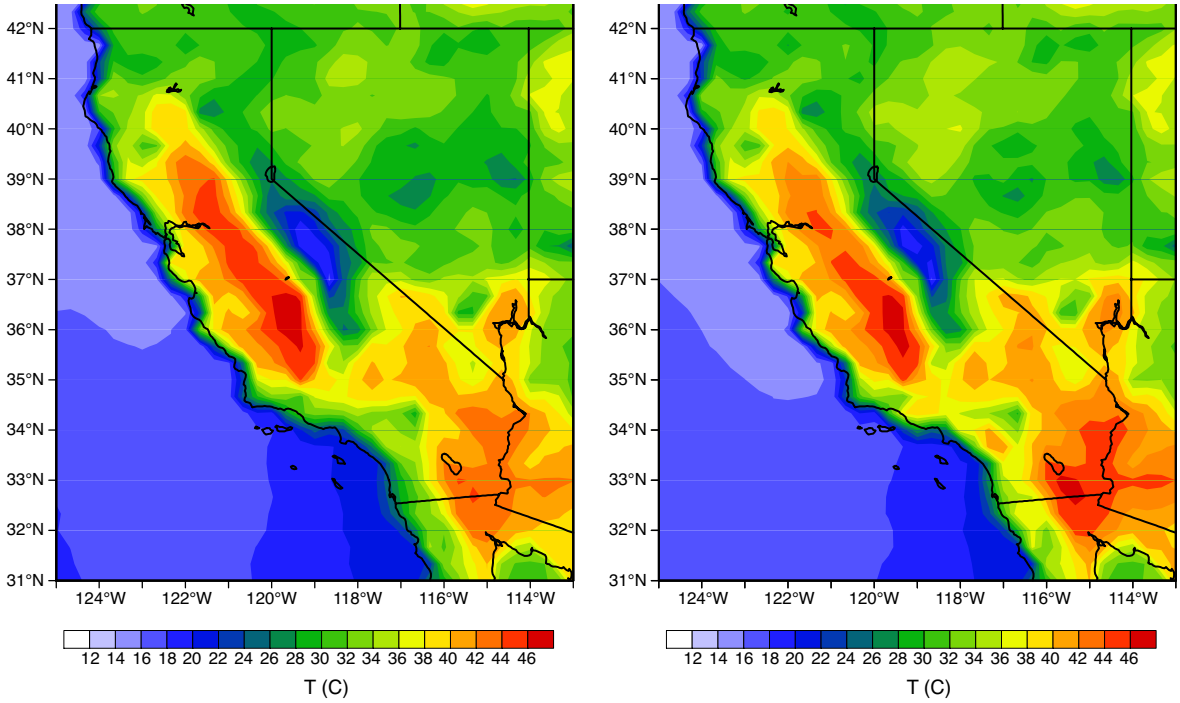


FIGURE S1. NARR Air Temperature at 2 m (°C) composite mean for 16:00 LT July 22nd 2006 (left) and 16:00 LT July 23rd 2006 (right).

Figure S1 shows NARR results for surface air temperature in July 22nd and July 23rd 2006 for comparison with simulated by the Weather Research Forecast model with fully coupled chemistry (WRF-Chem) Fig. 1 in the main text. Overall, surface air temperatures from reanalysis and from WRF-Chem show similar patterns for the heat wave. The hottest temperatures occur over a broad region in the Central Valley. Reanalysis data shows slightly hotter temperatures than that simulated

by WRF-Chem, but both exhibit substantial areas of temperature exceeding 42°C. Note that the resolution of the reanalysis data, at 32 km, is coarser than the resolution from the WRF-Chem fine domain at 12 km. The two locations used in the main text to compare meteorological variables—one in the coastal area of Los Angeles the other in the Central Valley at Fresno—are representative of an area partly ventilated by oceanic air and an area that reaches very warm temperatures, respectively, in the NARR as well as in the WRF simulation, even though the NARR misses fine scale features with the coast. On July 23, the NARR exhibits noticeably warmer temperatures in inland desert regions near the Arizona border. Overall the WRF simulation for surface temperature appears reasonable to use as a control example of a regional scale pattern active during a heat wave on which to conduct perturbation experiments.

Figure S2 shows the composite mean wind speed and wind direction at 200 mb for 14:00 LT July 22nd 2006 as obtained from NARR data. The 200 mbar level is examined because it is near the level of aerosol injection in the experiments of the main text and the horizontal advection speed is of interest. For comparison, Fig. S3 shows the wind speed and wind direction for the same time and level as simulated by WRF-Chem. The wind speed and wind direction show similar regional scale patterns (note that Fig. S3 and Fig. S2 cover slightly different areas, associated with different gridding). The WRF-Chem wind speeds span a reasonable range compared to the reanalysis, which is the significant feature for advection rates of the inserted aerosol cloud examined in the main text.

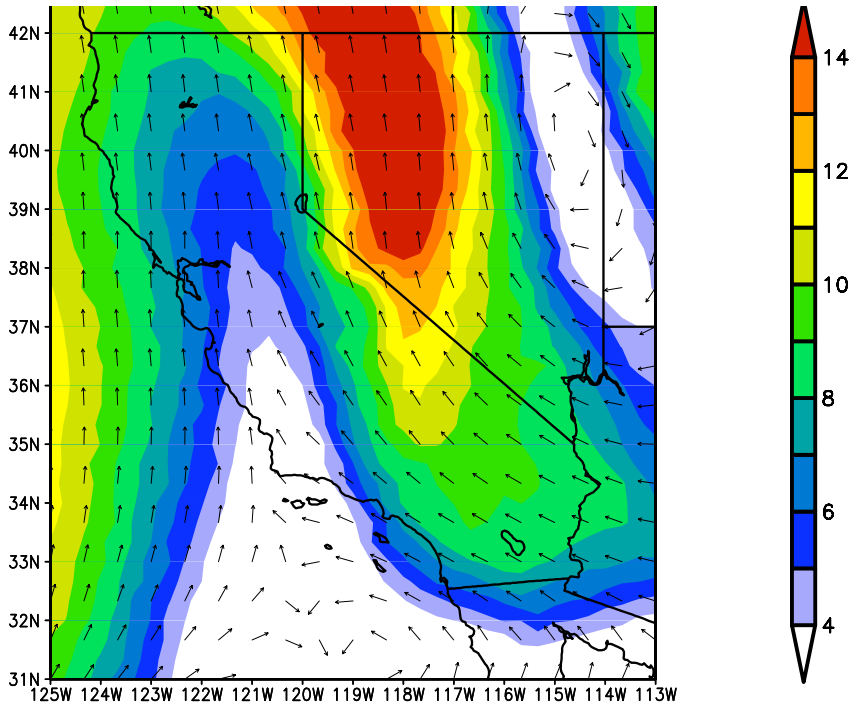


FIGURE S2. Wind speed (m/s) and wind direction at 200 mb (approximately the level of aerosol injection in experiments in main text) for 14:00 LT July 22nd 2006 NARR composite mean.

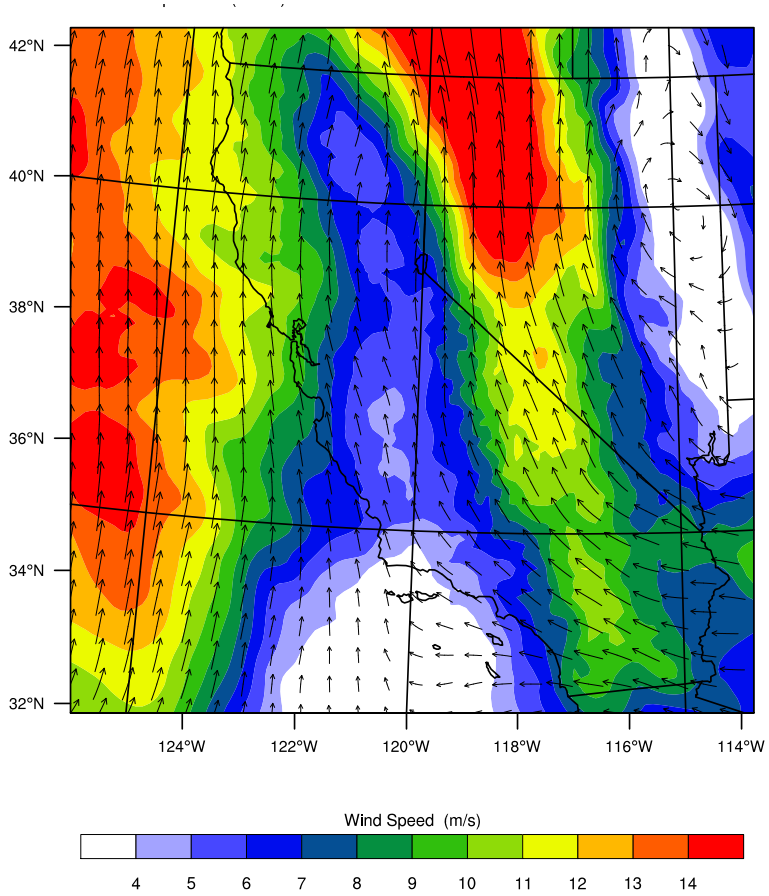


FIGURE S3. Wind speed (m/s) and wind direction at 200 mb (approximately the level of aerosol injection) for 14:00 LT July 22nd 2006 simulated by WRF-Chem.