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ARAC Dispersion Modeling of the August 1998 Tracy, California Tire Fire

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August 28, 1998

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by

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Summary

At about 4:30 pm PDT on Friday, August 7, 1998 a fire ignited the large tire disposal pit of Royster Tire Co. on MacArthur Drive about 5 km (3 miles) south of downtown Tracy, California. While providing on-scene mutual aid late Friday night, the LLNL Fire Department called and requested that the Atmospheric Release Advisory Capability (ARAC) make a plume forecast for Saturday. The response team in the field was interested in the forecasted location as well as an estimate of potential health effects on the following day. Not having any previous experience with tire fire source terms, ARAC assessors used a constant unit source rate (1 g/s) of particulate and produced plots showing only the location of the ground-level normalized time-integrated air concentrations from the smoke plume.

Very early Saturday morning the assessors faxed plots of ground-level smoke air concentrations forecasted for Saturday from 6 am through 6 pm PDT to the Tracy Fire Emergency Operations Center. (As a part of standard procedure, before delivering the plots, the assessors notified ARAC's DOE sponsor.) Fortunately due to the intense heat from the fire, the dense black smoke immediately lofted into the air preventing high ground-level concentrations close to the tire dump. Later on Saturday morning ARAC forecasted a second set of plume integrated air concentrations for Sunday. By Monday the intensity of the fire lessened, and ARAC's support was no longer requested.

Following ARAC's response, we made a third calculation on a larger scale of the continuous smoke dispersion for 3 days after the fire. A newspaper photograph showed the plume initially rising toward the northeast and the upper part of the smoke cloud turning counterclockwise toward the north. Winds from ARAC's mesoscale prognostic model reproduced this plume structure, while data from the Friday afternoon sounding from Oakland did not. On the 250 km scale, using gridded wind outputs from our mesoscale forecast model to initialize the dispersion model produced more realistic results than interpolating between the sparse surface and upper air wind observations available from airports.

Dispersion model results showed that some of the smoke eventually mixed down to the ground to the east and south of the fire Friday night. News articles also indicated smoke extending over Manteca, Lathrop, and Modesto Friday night. More elevated smoke was brought to the ground due to the extensive daytime vertical mixing on Saturday and Sunday. The model results reflected these observations showing wide patterns of diffuse ground-level smoke extended along the San Joaquin Valley from Sacramento to Fresno on Saturday and Sunday.

ARAC's Response

The LLNL Emergency Duty Officer (LEDO) contacted ARAC's on-call assessment meteorologist about 10:45 pm PDT Friday, August 7, 1998. This assessor learned that Lab Fire Chief Randy Bradley, who was aiding local firefighters at the Tracy tire fire, was interested in a projection of the plume for the next day. Two assessment meteorologists (assessors) were contacted and sent to the ARAC Center at LLNL shortly thereafter.

The assessors learned from the fire chief that a "20-acre pit about 100 ft deep" was burning at Royster Tire Co. south of Tracy. The extreme heat of the blaze (each tire contains one to two gallons of oil) caused a massive black cloud to rise about 5000-7000 ft above ground level (agl). We assumed that the tire fire was 100 m by 100 m and the smoke was fresh combustion particulate products with a median 1 μm diameter. To make the plume forecasts for Saturday, we used the forecasted wind data from the ARAC west coast run of the Naval Operational Atmospheric Prediction System (NORAPS) mesoscale prognostic model. We prepared and faxed the assumption sheet and forecasted plots (see Set 1 in Appendix A) valid at 0600, 1200, and 1800 PDT on Saturday, August 8 to the LLNL fire department at the Tracy Fire Emergency Operations Center. We presented the plots of normalized ground-level integrated air concentration on a 100 km by 100 km model domain.

Figure 1 depicts ARAC's emergency response modeling system. The primary models include CG-MATHEW (Conjugate-Gradient Mass-Adjusted THrEe-dimensional Wind) and ADPIC (Atmospheric Dispersion by Particle-in-Cell). Sullivan *et al.* (1993) summarizes the ARAC program, its history, the modeling system, and the accuracy of the models. We currently use a version of ADPIC implemented in 1995 called the Random Displacement Method (Nasstrom, 1995). We used a plume rise module in ADPIC to estimate the time-varying height of the smoke plume.

Two other assessors came to the ARAC Center Saturday morning and prepared a second set of plume forecasts for Sunday. Again the assessors developed an assumption sheet and forecasted integrated air concentration plots based on NORAPS forecasted winds out to 4:00 p.m. PDT Sunday and faxed the plots to the LLNL fire department contact in the field (see Set 2 in Appendix B).

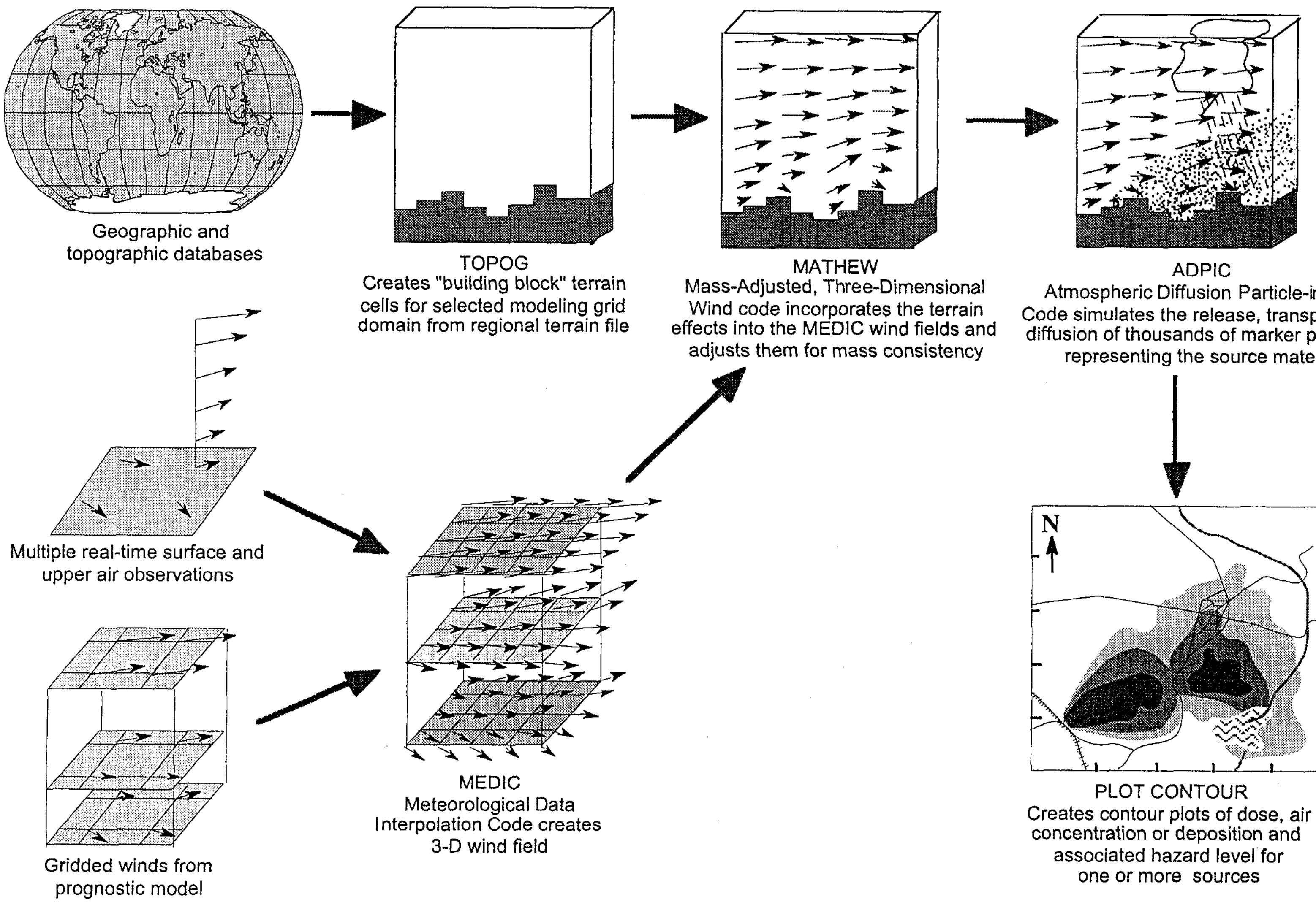

Figure 1. ARAC Emergency Response Modeling System

Post-Accident Assessment

Following the response, assessors made a single continuous model rerun out to 72 hours to evaluate the smoke impact on a larger scale.

Model Grid and Terrain

For the post-accident assessment we expanded the model grid from 100 to 250 km on a side and centered the grid over Modesto (Table 1).

Table 1. Model grid specifications

	North-South	East-West	Vertical
Number of cells	50	50	30
Individual cell size	5 km	5 km	100 m
Grid domain	250 km	250 km	3000 m

We used our online topographic database with 500 m resolution to develop mean terrain heights for each 5-km cell. As illustrated in Figure 1, the CG-MATHEW model adjusts the 3-D wind vector in each cell to conform to flow over or around terrain. Since Tracy and most of the downwind impact areas were over the flat Central Valley, terrain did not play a significant effect on the plume until it reached the either side of the Valley.

Within the overall uniform grid, we use a series of 4 inner "nested" grids to resolve the detail around the source location. Therefore, the highest grid resolution was 312.5 m on a side around the source.

Meteorology

Figure 1 illustrates that we can initialize our wind field with either wind observations or gridded wind data from a prognostic model or both. During the response ARAC was asked to forecast the plume position a day in advance. So for these calculations we used observed wind data from our routine NORAPS run over the west coast (see http://www-metdat.llnl.gov/aracdata/index.html). In the post-accident assessment we evaluated both observed and forecasted inputs.

Using our dedicated link to the Air Force Weather Agency, we collected 3 days of standard hourly surface observations and twice daily upper air soundings taken at airports in the 250 km region from 2300 UTC Friday, August 8 (1600 PDT) through 2300 UTC Monday. The general weather was fair with clear skies and highs in the Valley near 100 °F. Appendix C shows the surface and the Oakland radiosonde winds valid at 0000 UTC (1700 PDT) or about 30 minutes after the fire began. The surface wind barbs (C.1) indicate a vigorous sea breeze through the Delta continuing over Stockton, Modesto, and Merced. The Oakland sounding (C.2) indicated mostly light, westerly winds up to about 2000 m.

As prognostic models take several hours from initialization to stabilization, the best output is after 4 to 6 hrs into a run. To avoid spin-up errors we used the 6- through 17-hr forecasted wind fields of each successive 12-hour run as input for our 72-hr dispersion model calculation.

Appendix D shows hourly wind fields interpolated from NORAPS wind inputs at several heights. For the first and 12th hours, we show the 10-, 600-, and 3000-m levels (2330 UTC or 1630 PDT). For the remaining 60 hours we show the 10- and 600-m levels. Note that the 3000-m wind field at 2330 UTC (D.3) indicates nearly southerly winds as the fire started. As will be discussed further later, this upper flow agrees with the observed transport of the plume. Appendix E provides NORAPS vertical wind profiles and data in the center of the grid about 50 km east of Tracy.

Our experience with several past responses of mesoscale (100-1000 km) dispersion is that the greater spatial and temporal resolution of a mesoscale prognostic model produces higher fidelity wind fields than can be developed from interpolating between observed wind data. This was true in this case, because of the sparse surface observations and the lack of an upper air sounding in the Central Valley. We run NORAPS on a 3-way nested grid with an inner-most resolution of 12 km. This produced 20 x 20 or 400 modeled "soundings" to initialize the wind field over the 250 km domain.

Other time-varying meteorological inputs to CG_MATHEW include atmospheric stability and mixing layer height. We estimated stability and mixing layer heights according to time of day, wind speed, and cloudiness. These variables control the amount of vertical and horizontal dispersion of the smoke. As indicated by the brisk surface winds (typically greater than 5 m/s), we used Pasquill-Gifford category D from the start of the fire until early morning of August 8th. Afterwards, we varied the stability category from B during midday to E at night. We varied the mixing layer height from 1200 m during afternoon and early evening to 600 m during early morning hours.

Source Term and Plume Rise

We modeled only the particulate from the tire fires, not the gaseous products. For the post-accident assessment, we varied a normalized dimensionless release rate with time. During the first 12 hours, when thick black smoke was observed, we used a source rate of 1/s. Since the smoke became less dense and whiter by the next morning, we reduced the release rate by 60%, or to 0.4/s during the next 60 hours. This reduction was abrupt and arbitrary, representing the general idea that the source was substantially less by Saturday morning.

Table 2 lists the time-varying source term assumptions. As the fire cooled, we adjusted the maximum plume rise (plume stabilization height) downward from 2500 to 500 m agl 12 hr after the fire started. By lowering the plume, this abrupt change increased nearby atmospheric concentrations Saturday morning. However, later in the morning, as temperatures warmed greater vertical dispersion reduced ground-level air concentrations again.

Table 2. Source terms assumptions

DATE/TIME	Release rate (s^{-1})	Maximum plume rise (m agl)
2330 Z 07 Aug – 1130 Z 08 Aug	1.0	2500
1130 Z 08 Aug – 2330 Z 10 Aug	0.4	500

Deposition Parameters

During clear weather, particulates are removed from the atmosphere and deposited on the ground by the following processes:

- turbulent diffusion,
- gravitational settling, and
- dry deposition via the flux of material from a layer just above the surface to the ground.

ADPIC models each of these processes separately. Turbulent diffusion is calculated using Random Displacement Method. Gravitational settling is modeled by the particle size-dependent Stokes law settling velocity. Dry and wet deposition are parameterized using deposition velocities.

While initial combustion products are typically submicron in size, with time particulates in a dense smoke plume can grow in size by chemical reactions, condensation, and agglomeration. Therefore, for the 3-day run we estimated parameters for a log-normal particle size distribution (PSD) shown in Table 3 to represent a stabilized smoke cloud. Dry deposition velocity is typically greater than or equal to the gravitational settling velocity. We used 1 cm/sec for a 5 μm median diameter PSD.

Table 3. Smoke particle size distribution parameters

Log-normal particle size distribution parameter	Value Used (μm)
Maximum diameter	100
Median diameter	5
Minimum diameter	0.5
Standard Geometric Deviation	5

Results

Appendix F shows an aerial picture of the plume taken a few hours after the fire started compared with a plot from the dispersion model. Both photo and model views are approximately to the northeast. Aircraft pilots indicated that the top of the bending, thick black smoke plume was between 2000 and 2500 m agl. The photograph shows that strong, low-level winds initially transport the plume eastward and as the plume rises and encounters southerly winds, the plume bends toward the north. The flat bottom toward the end of the plume indicates that it probably extended above the mixing height, and did not immediately mix back down through the top of the temperature inversion.

Appendixes G, H, and I include instantaneous, integrated, and deposition plots for the 3-day simulation. Since we used a dimensionless source rate, we only produced relative concentration and deposition patterns resulting from the fire. These plots can indicate health effects if a mass source rate is applied and toxicological levels are known for that material.

A series of instantaneous plots are useful to describe the progression of the fire. The instantaneous plot valid 6 hours into the run (G.1) indicates that a very small amount of smoke from the lower part of the plume traveled eastward and dispersed to breathing height at 1.5 m above the ground. The vast amount of smoke associated with the upper plume traveling northward is too high in the atmosphere to reach the ground by this time. The instantaneous plot valid 6 hours later at 1130 Z on August 8 (G.2) indicates that the smoke from the elevated plume impacted the ground northeast of Tracy to north of Sacramento. The NORAPS winds indicate that the layer of southerly winds has deepened closer to the ground, allowing a small amount of smoke to reach the ground. Smoke concentrations are less east of Tracy.

The next two instantaneous plots at 1730 and 2330 Z on August 8 (G.3 and G.4) indicate that low-level westerly winds cause the highest concentrations to occur just east of the fire. The strong daytime vertical mixing allows the smoke to quickly disperse downward from the plume which then extended only to 500-m agl. The strong vertical mixing also disperses the smoke upward into the higher level southerly winds; the northward moving plume then disperses downward to the surface, causing small concentrations northward past Sacramento. Most of the smoke is transported southeastward through the San Joaquin Valley during the next 24 hours. Northeasterly winds at higher levels transport some smoke into the San Francisco Bay Area on August 10^{th} (G.8).

Integrated plots describe total passage of smoke over a time period, and if a mass source rate is known, can be used to estimate the health effects from a pollutant. Appendix H shows integrated concentrations for cumulative periods ending at 1, 2, and 3 days after the fire began. These plots are provided in two scales – 60 and 250 km. The 250-km map on August 8^{th} (H.1) shows that the plume reached the ground from Sacramento to Turlock. The 60-km map (H.2) indicates that the highest levels (0.001 s/m^3) extend about 5 km to the east-southeast of the fire. The integrated plot ending on August 9^{th} (H.3) shows the influence of the lower (500 m) plume rise – low-level winds carry the smoke farther southeast in the San Joaquin Valley and concentrations are somewhat higher. The final 3-day integrated plot (H.5) shows that low-level northeasterly winds transported some smoke westward over the Altamont Pass toward Livermore.

Actual air concentrations of a particular material can be estimated by multiplying the normalized contour values by an estimate of the total mass released over the time period represented by the integrated plots. The material may be any particulate which can be represented by our PSD. (Lemieux and Ryan, 1993 published several emission rates for tire fires.) Inhaled particulate matter can then be estimated by multiplying the integrated air concentration contours by the fraction of particles expected to be less than or equal to 10 μm in diameter and then multiplying by a breathing rate, such as 3.33×10^{-4} m^3/s the light activity rate for adults. An inhaled integrated air concentration assumes that the person remained stationary for the integration period. Average air concentration can be computed by dividing the integrated air concentration by the integration period.

Appendix I shows cumulative deposition plots on the 60 and 250 km maps. The large map indicates that the deposition tracks the initial elevated plume toward Sacramento as well as a plume southeastward in the San Joaquin Valley. A small area also extends to the west. The close-in map indicates that the highest values of $0.001/m^2$ extend several kilometers east and southeast of the fire. The mass deposited can be obtained by multiplying the normalized deposition contour values by the estimated total mass released.

Acknowledgments

The authors thank Cyndi Brandt and Lourdes Placeres for preparing several of the figures and assisting with the preparation of this report.

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Lemieux, P. M.; Ryan, J. V., 1993. Characterization of Air Pollutants Emitted From a Simulated Scrap Tire Fire. *J. Air & Waste Mgmt. Assoc.,* Vol. 43, 1106-1115.

Nasstrom, J., S., 1995: Turbulence Parameterizations for the Random Displacement Method (RDM) Version of ADPIC. Lawrence Livermore Report UCRL-ID-120965.

Sullivan, T.S., J.S. Ellis, C.S. Foster, K.T. Foster, R.L. Baskett, J.S. Nasstrom, and W.W. Schalk III, 1993: Atmospheric Release Advisory Capability: Real-time modeling of airborne hazardous materials. *Bull. Amer. Meteor. Soc.*, **74**: 2343–2361. Available under Links at http://www-ep.es.llnl.gov/www-ep/atm/ARAC/arac.html.

Lawrence Livermore National Laboratory

A·R·A·C Atmospheric Release Advisory Capability

08 August 1998

SET 1
ARAC Simulation of the Tracy Tire fires

SOURCE TERM ASSUMPTIONS

Material:	Smoke from burning tires
Release location:	37° 41.21' N, 121° 25.09' W(close estimate from on-scene firefighters)
Release Information:	Continuous 100 m x 100 m area fire source producing 1925 m or 6315 ft buoyant vertical plume rise. No attempt was made to estimate the total combustion product rate (in grams per second); consequently, a normalized 1 gram/sec rate has been used.
Particle size distribution:	1.0 µm median diameter (PSD from 0.5 - 1.5 µm)

COMPUTATIONAL INFORMATION

Grid domain:	100 by 100 km horizontal, 3000 m vertical
Run duration:	18 hours from 0000 LT (0700 UTC) 08 August through 1800 LT 08 August (0100 UTC 09 August)

METEOROLOGICAL INPUTS

Three-hour forecast gridded wind data from Naval Operational Regional Atmospheric Prediction System run here at LLNL.

ARAC PLOTS

1. Six hour forecast Integrated Air Concentration valid at 0600 LT, (1300 UTC) 08 August

Note: Due to nighttime stability, and the vigorous vertical plume rise, the model did not calculate any significant smoke plume reaching the surface before sunrise.

2. Twelve hour forecast Integrated Air Concentration valid at 1200 LT, (1900 UTC) 08 August
3. Eighteen hour forecast Integrated Air Concentration valid at 1800 LT 08 August (0100 UTC 09 August)

This plots represent the integrated air concentration at breathing height over the duration of the forecast period.

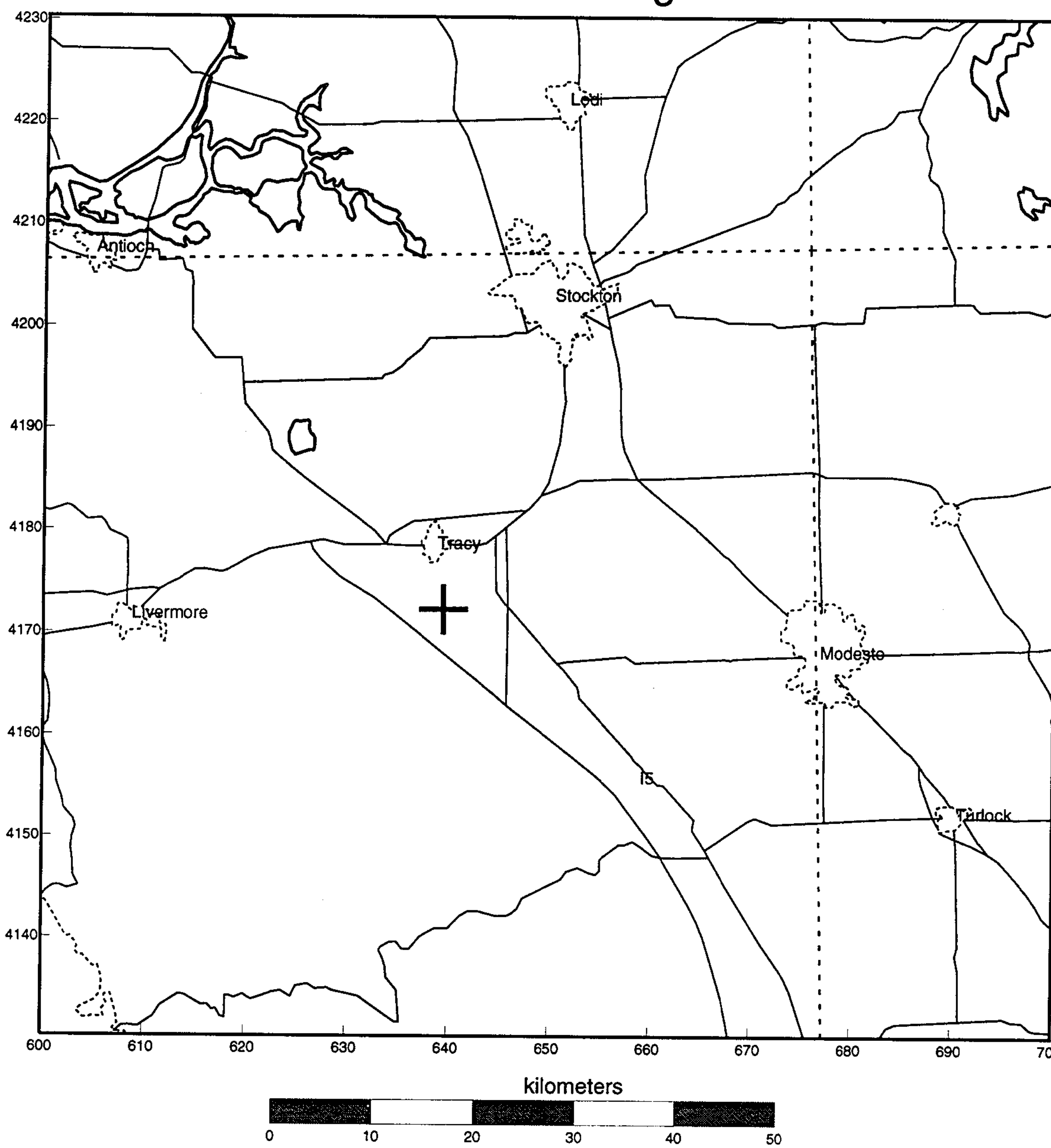
NOTE: These normalized plots can be used to determine the likely plume location, but not estimate the health effects. In general, due to the vigorous vertical plume rise and the down-range mixing, no significant health effects can be expected from the combustion products.

SUMMARY OF ARAC CALCULATIONS

Date	Set	Source Information	Release Amount	Meteorological Data
08 August 1998	1	100 m x 100 m continuous, buoyant fire source centered at 37° 41.21' N, 121° 25.09' W, approx. 1/2 mile south of Linne Rd and east of Macarthur	1 g/s normalized source	3-hour NORAPS forecast data

SET 1: 6-Hr Forecast Integ Air Conc

Tracy Tire Fires Simulation

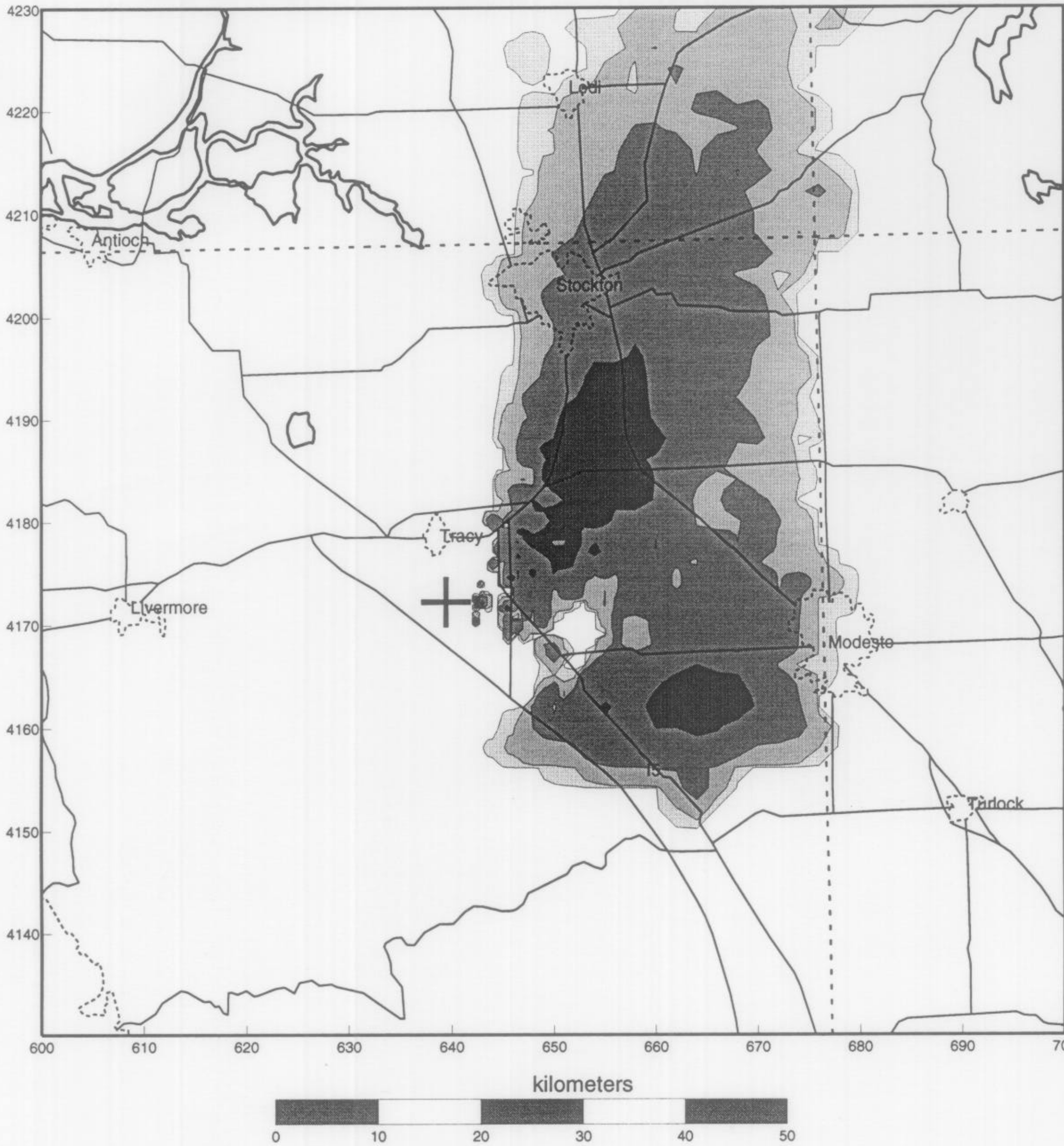


Plot Generation Time 8AUG98 09:12:00 UTC	
Contour Type Integrated air at 1.5 meters 08AUG98 07:00:00 to 08AUG98 13:00:00 UTC	
Material SMOKE	
Source Location (longitude, latitude) 121° 25' 05" W, 37° 41' 12" N	
Source Location (x, y, projection) 639.47 km E, 4172.24 km N, UTM	
Remarks ARAC PLOT - VALID 0600 LT (1300 UTC) 08 AUGUST 1998 Continuous large area fire source. Buoyant plume rise to simulate 6-7K ft observed plume height. Used forecast meteorological data. 1 g/s for 24 hour	
Contours: (Level and Area Covered)	
> 1.00e-04 g-s/m3	0.04 sq km
> 1.00e-05 g-s/m3	0.14 sq km
> 1.00e-06 g-s/m3	0.20 sq km
> 1.00e-07 g-s/m3	0.22 sq km

ARAC ID: TIRES/FOR_SAT 08AUG98_0070

SET 1: 12-Hr Forecast Integ Air Conc

Tracy Tire Fires Simulation



Plot Generation Time
8AUG98 09:12:00 UTC

Contour Type
Integrated air at 1.5 meters
08AUG98 07:00:00 to 08AUG98 19:00:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

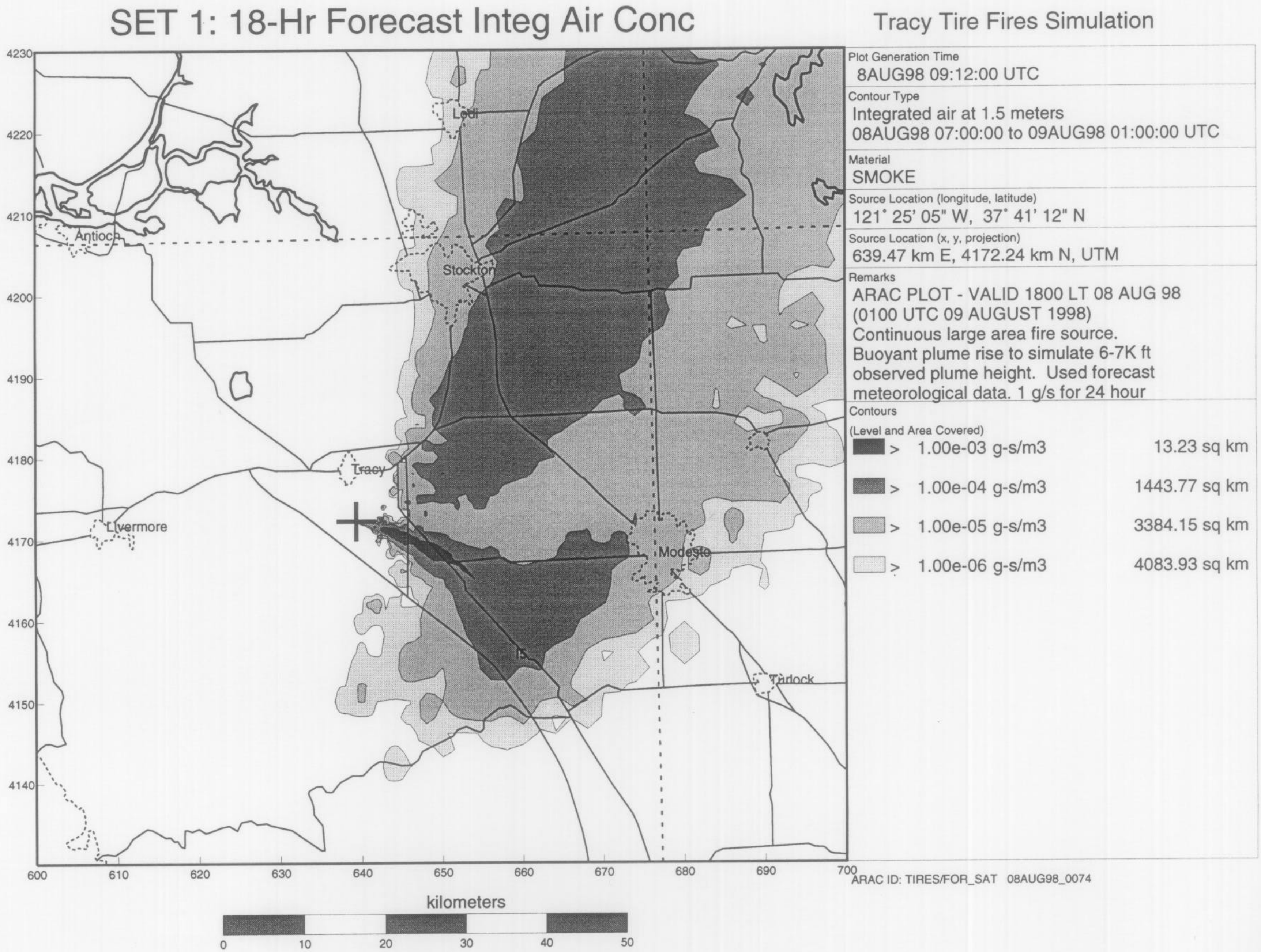
Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
ARAC PLOT - VALID 1200 LT (2000 UTC)
08 AUGUST 1998
Continuous large area fire source.
Buoyant plume rise to simulate 6-7K ft observed plume height. Used forecast meteorological data. 1 g/s for 24 hour

Contours:
(Level and Area Covered)

> 1.00e-04 g-s/m3	210.30 sq km
> 1.00e-05 g-s/m3	1301.71 sq km
> 1.00e-06 g-s/m3	2056.66 sq km
> 1.00e-07 g-s/m3	2341.07 sq km

ARAC ID: TIRES/FOR_SAT 08AUG98_0072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Tracy Tire Fires Simulation
Plot Generation Time
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Contour Type
Integrated air at 1.5 meters
08AUG98 07:00:00 to 09AUG98 01:00:00 UTC
Material
SMOKE
Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N
Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM
Remarks
ARAC PLOT - VALID 1800 LT 08 AUG 98
(0100 UTC 09 AUGUST 1998)
Continuous large area fire source.
Buoyant plume rise to simulate 6-7K ft
observed plume height. Used forecast
meteorological data. 1 g/s for 24 hour
Contours
(Level and Area Covered)
> 1.00e-03 g-s/m3 13.23 sq km
> 1.00e-04 g-s/m3 1443.77 sq km
> 1.00e-05 g-s/m3 3384.15 sq km
> 1.00e-06 g-s/m3 4083.93 sq km
Lodi
Antioch
Stockton
Tracy
Livermore
Modesto
I5
Turlock
4230
4220
4210
4200
4190
4180
4170
4160
4150
4140
600
610
620
630
640
650
660
670
680
690
700
ARAC ID: TIRES/FOR_SAT 08AUG98_0074
kilometers
0
10
20
30
40
50

Lawrence Livermore National Laboratory

A·R·A·C
Atmospheric Release Advisory Capability

08 August 1998

SET 2
ARAC Simulation of the Tracy Tire fires

SOURCE TERM ASSUMPTIONS

Material:	Smoke from burning tires
Release location:	37° 41.21' N, 121° 25.09' W (close estimate from on-scene firefighters)
Release Information:	Continuous 100 m x 100 m area fire source producing 1925 m or 6315 ft buoyant vertical plume rise. No attempt was made to estimate the total combustion product rate (in grams per second); consequently, a normalized 1 gram/sec rate has been used.
Particle size distribution:	1.0 µm median diameter (PSD from 0.5 - 1.5 µm)

COMPUTATIONAL INFORMATION

Grid domain:	100 by 100 km horizontal, 3000 m vertical
Run duration:	48 hours from 1630 LT (2330 UTC) 07 August through 1700 LT 09 August (0000 UTC 10 August)

METEOROLOGICAL INPUTS

Observational data from 2330 UTC on 7 August through 1530 UTC on 8 August.

Hourly forecast gridded wind data from Naval Operational Regional Atmospheric Prediction System run here at LLNL, from 1630 UTC on 8 August through 2330 UTC on 9 August.

ARAC PLOTS

1. Eighteen hour forecast Integrated Air Concentration valid at 1030 LT, (1730 UTC) 08 August
2. Twenty-four hour forecast Integrated Air Concentration valid at 1630 LT, (2330 UTC) 08 August
3. Thirty-six hour forecast Integrated Air Concentration valid at 0430 LT, (1130 UTC) 09 August)
4. Forty-two hour forecast Integrated Air Concentration valid at 1030 LT, (1730 UTC) 09 August)
5. Forty-eight hour forecast Integrated Air Concentration valid at 1630 LT, (2330 UTC) 09 August)

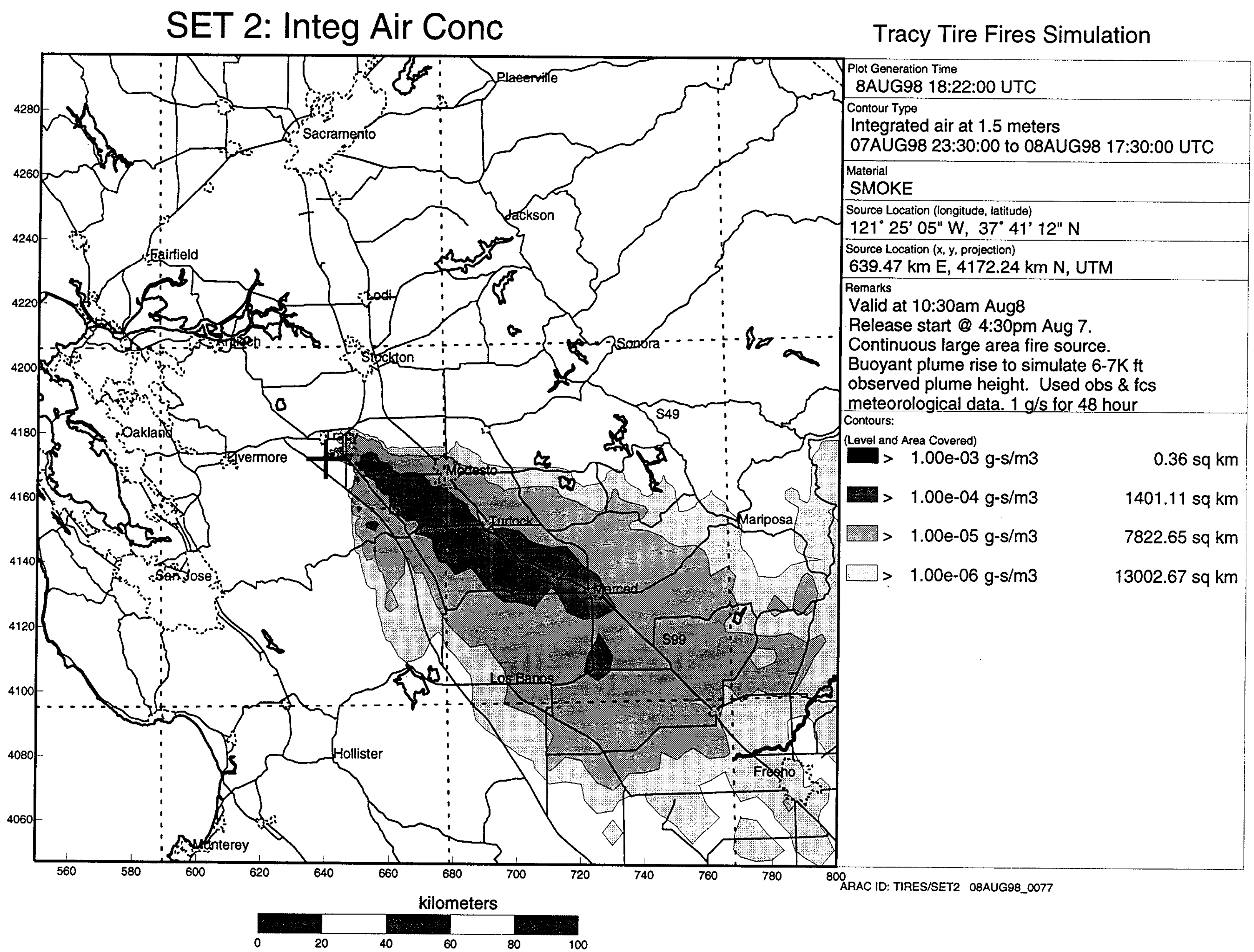
This plots represent the integrated air concentration at breathing height over the duration of the forecast period.

NOTE: These normalized plots can be used to determine the likely plume location, but not estimate the health effects. In general, due to the vigorous vertical plume rise and the down-range mixing, no significant health effects can be expected from the combustion products.

SUMMARY OF ARAC CALCULATIONS

Date	Set	Source Information	Release Amount	Meteorological Data
08 August 1998	1	100 m x 100 m continuous, buoyant fire source centered at 37° 41.21' N, 121° 25.09' W, approx. 1/2 mile south of Linne Rd and west of Macarthur	1 g/s normalized source	3-hour NORAPS forecast data

Date	Set	Source Information	Release Amount	Meteorological Data
09 August 1998	2	100 m x 100 m continuous, buoyant fire source centered at 37° 41.21' N, 121° 25.09' W, approx. 1/2 mile south of Linne Rd and west of Macarthur	1 g/s normalized source	Observed wind data from 2330 UTC on 7 Aug through 1530Z on 8 Aug, then hourly NORAPS forecast data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Tracy Tire Fires Simulation
Plot Generation Time
8AUG98 18:22:00 UTC
Contour Type
Integrated air at 1.5 meters
07AUG98 23:30:00 to 08AUG98 17:30:00 UTC
Material
SMOKE
Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N
Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM
Remarks
Valid at 10:30am Aug8
Release start @ 4:30pm Aug 7.
Continuous large area fire source.
Buoyant plume rise to simulate 6-7K ft
observed plume height. Used obs & fcs
meteorological data. 1 g/s for 48 hour
Contours:
(Level and Area Covered)
> 1.00e-03 g-s/m3 0.36 sq km
> 1.00e-04 g-s/m3 1401.11 sq km
> 1.00e-05 g-s/m3 7822.65 sq km
> 1.00e-06 g-s/m3 13002.67 sq km
Placerville
Sacramento
Jackson
Fairfield
Lodi
Stockton
Sonora
S49
Oakland
Livermore
Tracy
Modesto
Turlock
Mariposa
San Jose
Merced
S99
Los Banos
Hollister
Fresno
Monterey
4280
4260
4240
4220
4200
4180
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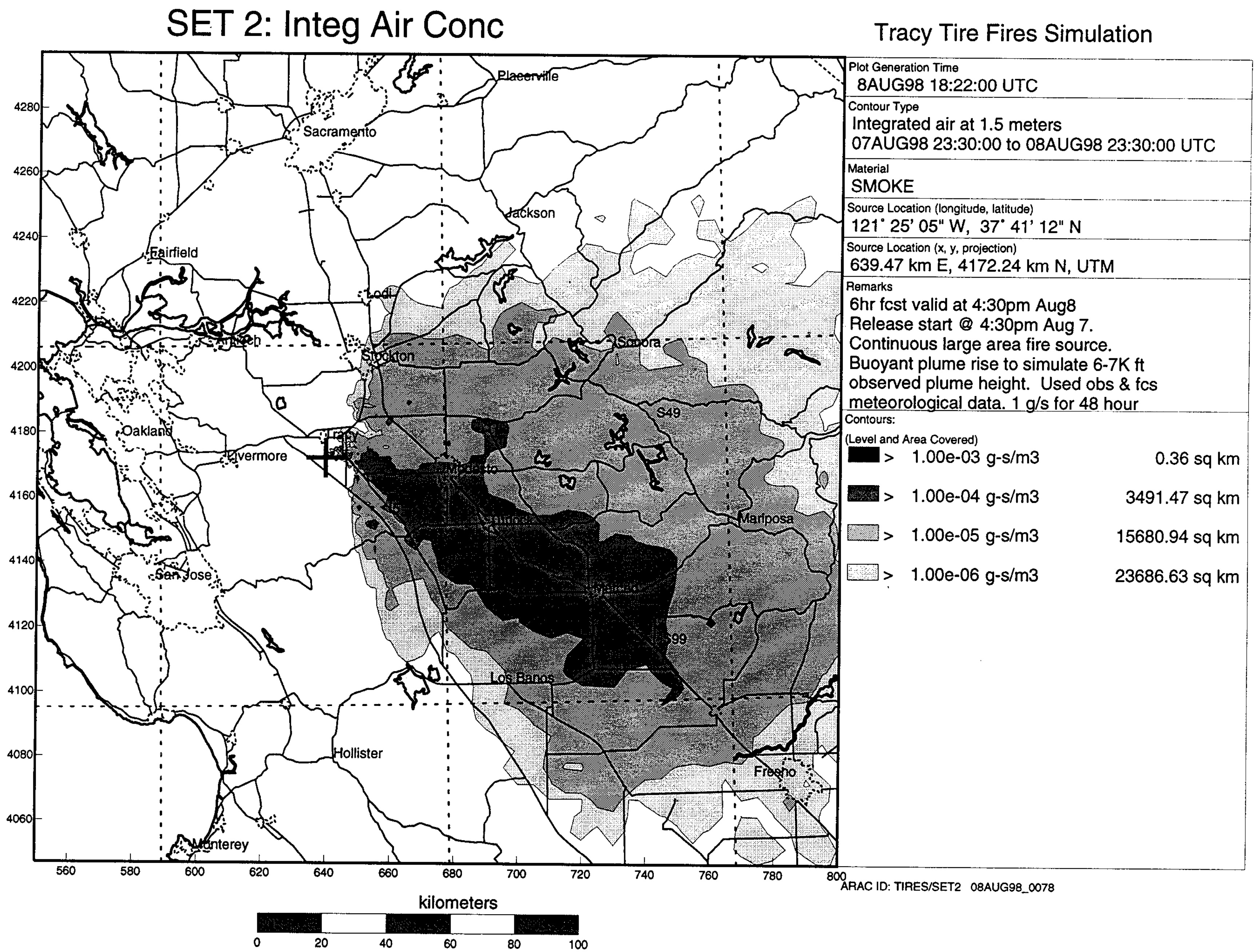
SET 2: Integ Air Conc
Tracy Tire Fires Simulation
Plot Generation Time
8AUG98 18:22:00 UTC
Contour Type
Integrated air at 1.5 meters
07AUG98 23:30:00 to 08AUG98 23:30:00 UTC
Material
SMOKE
Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N
Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM
Remarks
6hr fcst valid at 4:30pm Aug8
Release start @ 4:30pm Aug 7.
Continuous large area fire source.
Buoyant plume rise to simulate 6-7K ft
observed plume height. Used obs & fcs
meteorological data. 1 g/s for 48 hour
Contours:
(Level and Area Covered)
> 1.00e-03 g-s/m3 0.36 sq km
> 1.00e-04 g-s/m3 3491.47 sq km
> 1.00e-05 g-s/m3 15680.94 sq km
> 1.00e-06 g-s/m3 23686.63 sq km
Placerville
Sacramento
Jackson
Fairfield
Lodi
Stockton
Sonora
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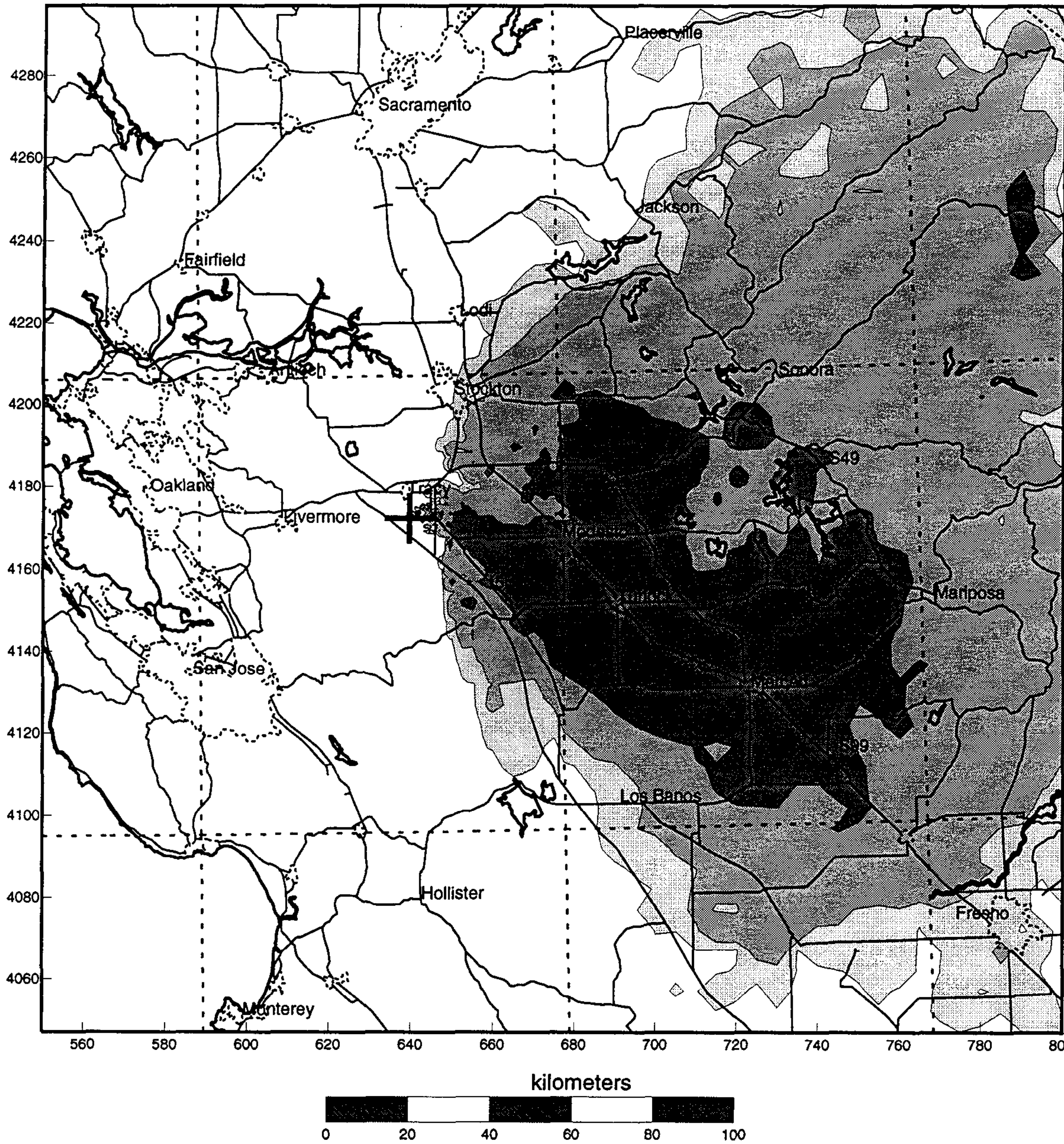
4260
4240
4220
4200
4180
4160
4140
4120
4100
4080
4060
560 580 600 620 640 660 680 700 720 740 760 780 800
ARAC ID: TIRES/SET2 08AUG98_0078
kilometers
0 20 40 60 80 100

SET 2: Integ Air Conc

Tracy Tire Fires Simulation



Plot Generation Time
8AUG98 18:22:00 UTC

Contour Type
Integrated air at 1.5 meters
07AUG98 23:30:00 to 09AUG98 11:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Valid at 10:30am Aug8
Release start @ 4:30pm Aug 7.
Continuous large area fire source.
Buoyant plume rise to simulate 6-7K ft observed plume height. Used obs & fcs meteorological data. 1 g/s for 48 hour

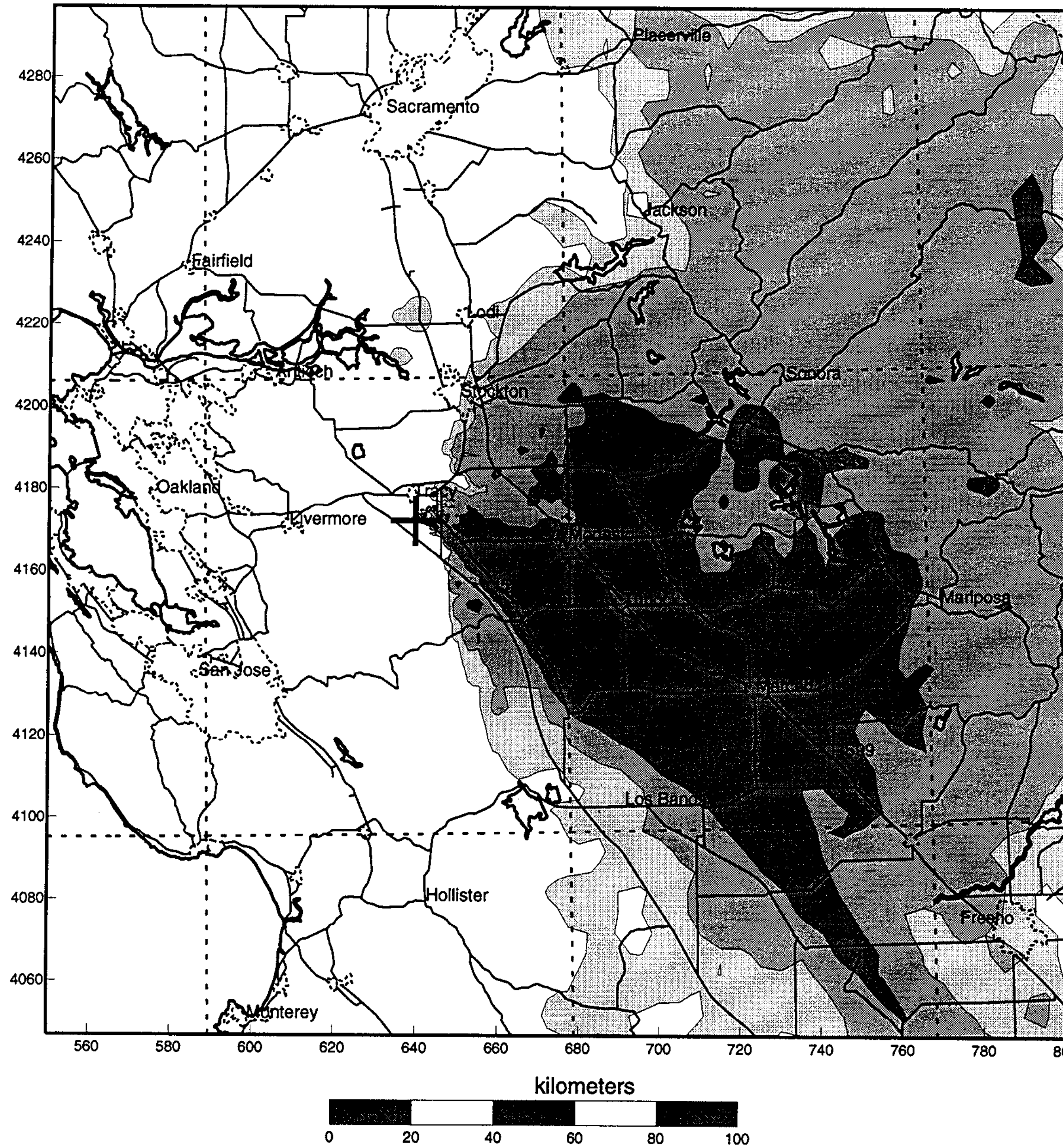
Contours:
(Level and Area Covered)

>	1.00e-03 g-s/m3	0.36 sq km
>	1.00e-04 g-s/m3	6554.23 sq km
>	1.00e-05 g-s/m3	24293.93 sq km
>	1.00e-06 g-s/m3	30014.34 sq km

ARAC ID: TIRES/SET2 08AUG98_0079

SET 2: Integ Air Conc

Tracy Tire Fires Simulation



Plot Generation Time	8AUG98 18:22:00 UTC
Contour Type	Integrated air at 1.5 meters 07AUG98 23:30:00 to 09AUG98 17:30:00 UTC
Material	SMOKE
Source Location (longitude, latitude)	121° 25' 05" W, 37° 41' 12" N
Source Location (x, y, projection)	639.47 km E, 4172.24 km N, UTM
Remarks	24hr fcst valid at 10:30am Aug9 Release start @ 4:30pm Aug 7. Continuous large area fire source. Buoyant plume rise to simulate 6-7K ft observed plume height. Used obs & fcs meteorological data. 1 g/s for 48 hour

Contours:

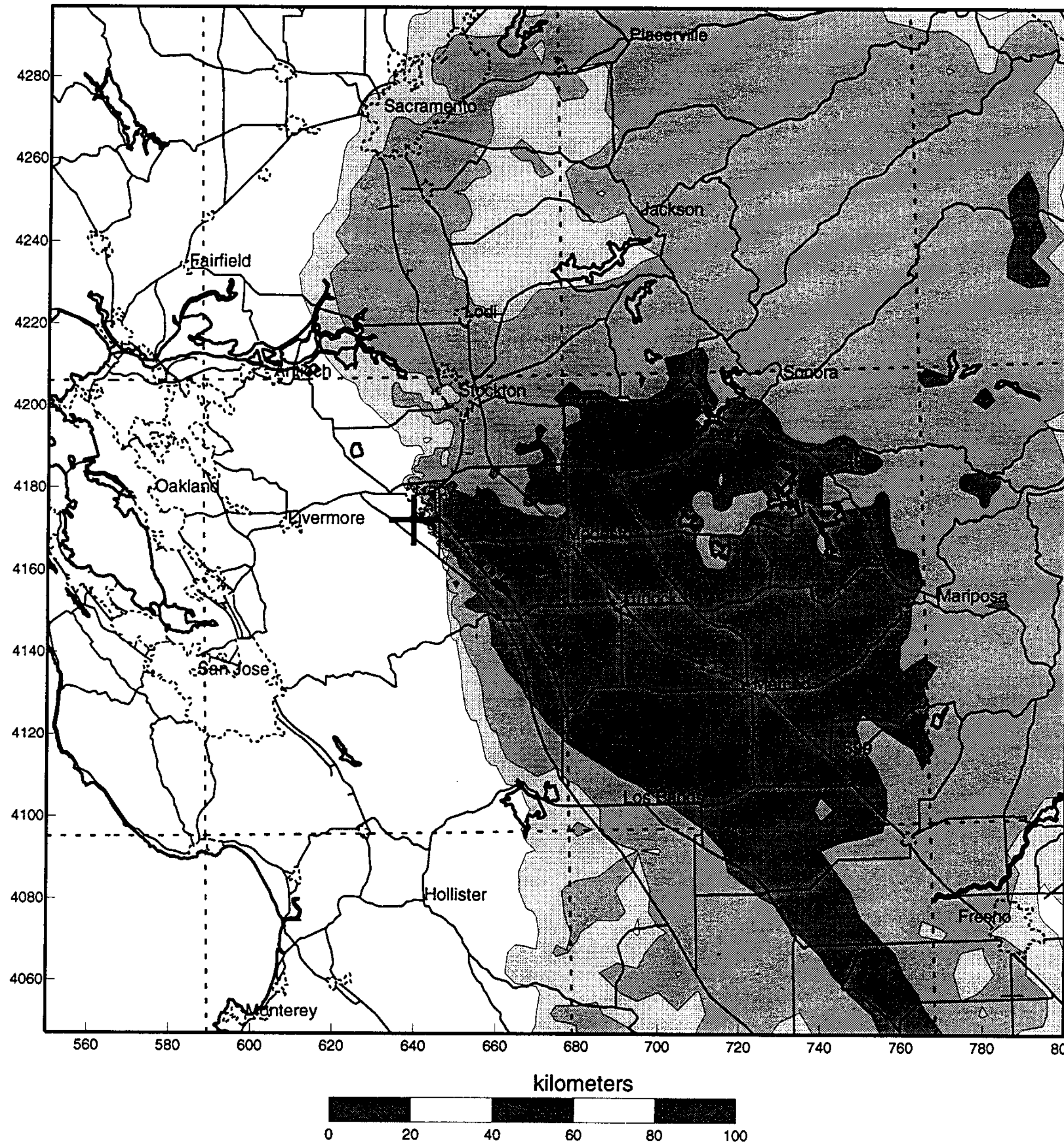
(Level and Area Covered)

Level	Area Covered
> 1.00e-03 g-s/m3	1.90 sq km
> 1.00e-04 g-s/m3	8069.15 sq km
> 1.00e-05 g-s/m3	26965.09 sq km
> 1.00e-06 g-s/m3	33163.31 sq km

ARAC ID: TIRES/SET2 08AUG98_0080

SET 2: Integ Air Conc

Tracy Tire Fires Simulation



Plot Generation Time
8AUG98 18:22:00 UTC

Contour Type
Integrated air at 1.5 meters
07AUG98 23:30:00 to 09AUG98 23:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

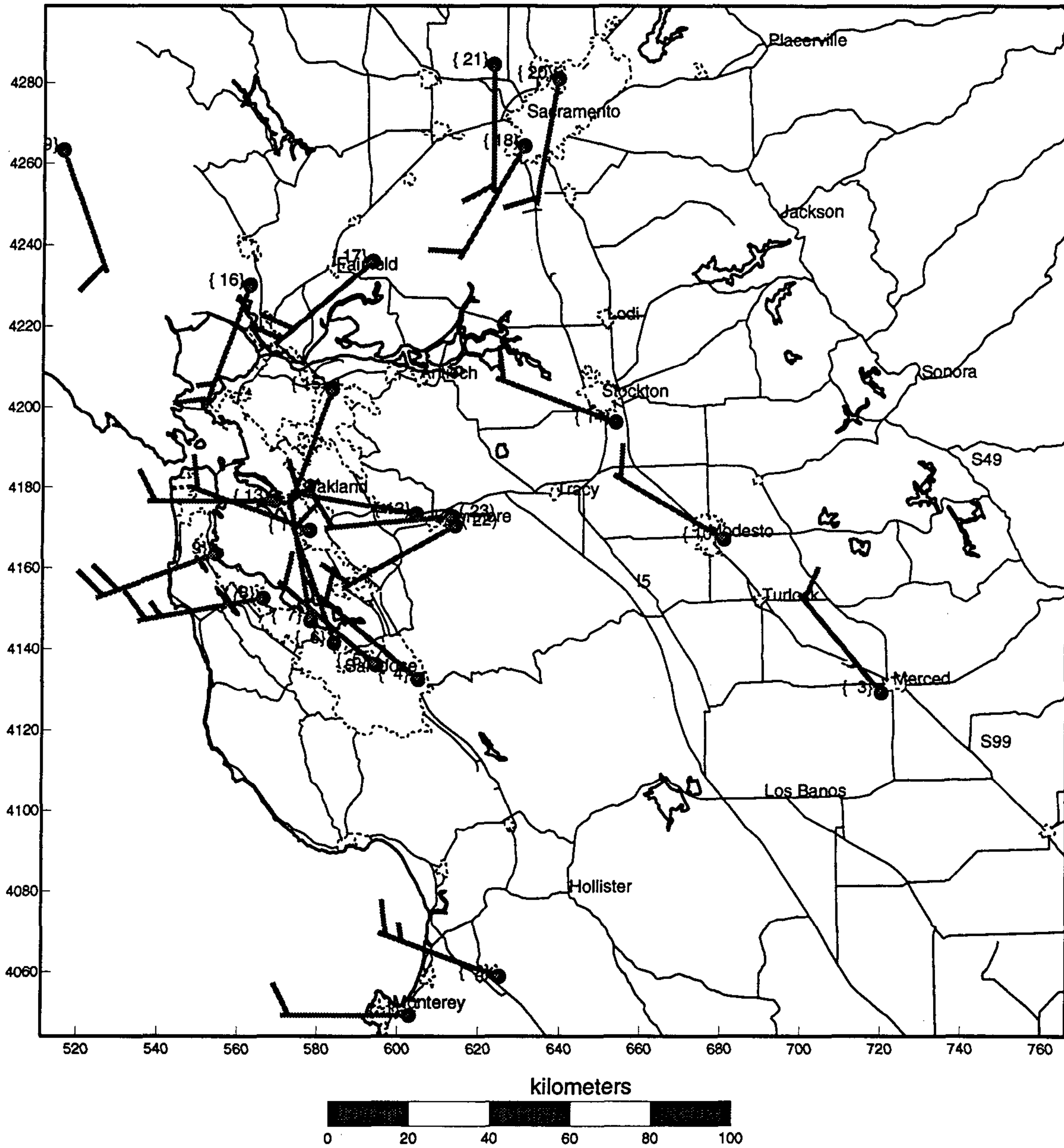
Remarks
6hr fcst valid at 4:30pm Aug8
Release start @ 4:30pm Aug 7.
Continuous large area fire source.
Buoyant plume rise to simulate 6-7K ft
observed plume height. Used obs & fcs
meteorological data. 1 g/s for 48 hour

Contours:
(Level and Area Covered)

> 1.00e-03 g-s/m3	20.99 sq km
> 1.00e-04 g-s/m3	10320.87 sq km
> 1.00e-05 g-s/m3	33584.16 sq km
> 1.00e-06 g-s/m3	39292.12 sq km

ARAC ID: TIRES/SET2 08AUG98_0081

TIRES 250



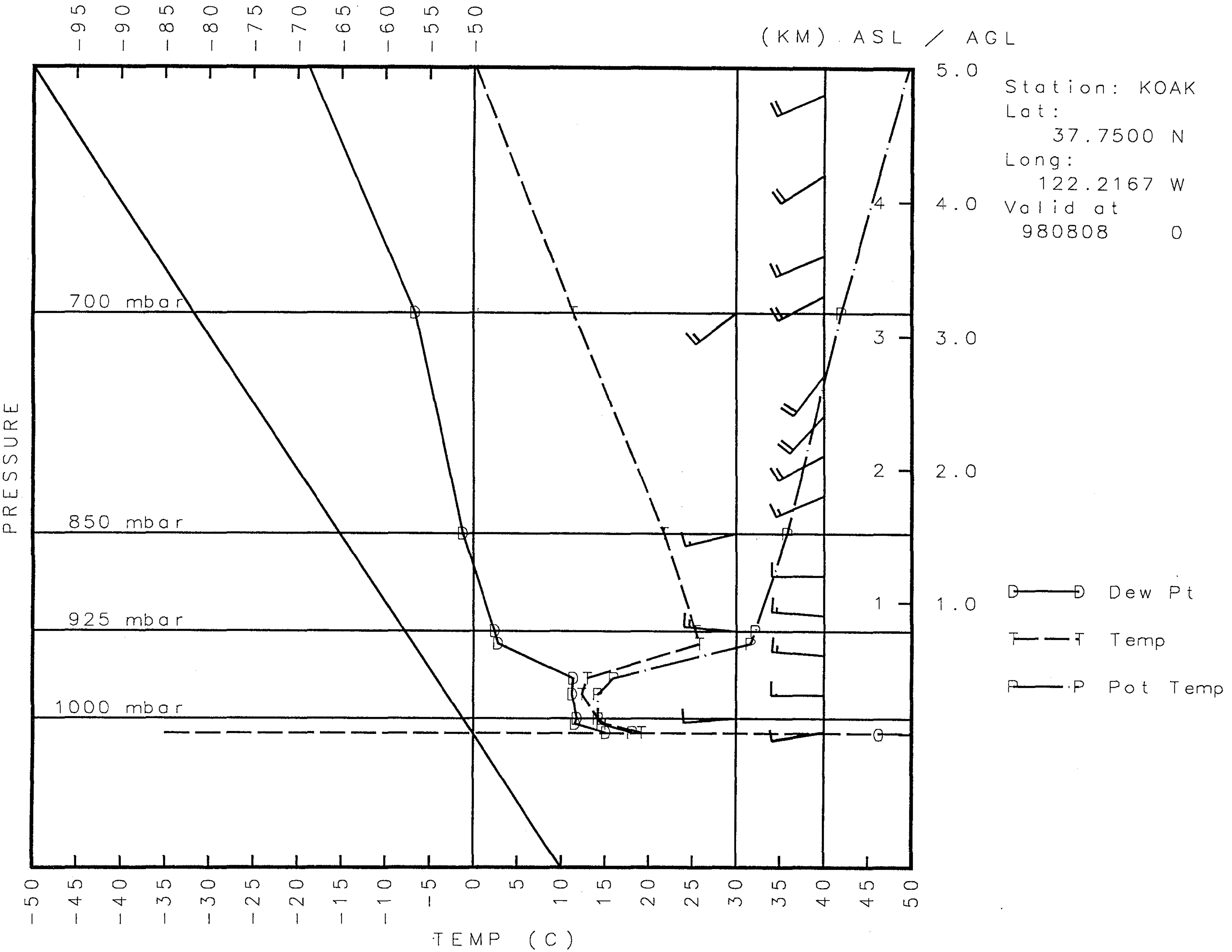
Data Set Time

08-Aug-98 00:00GMT

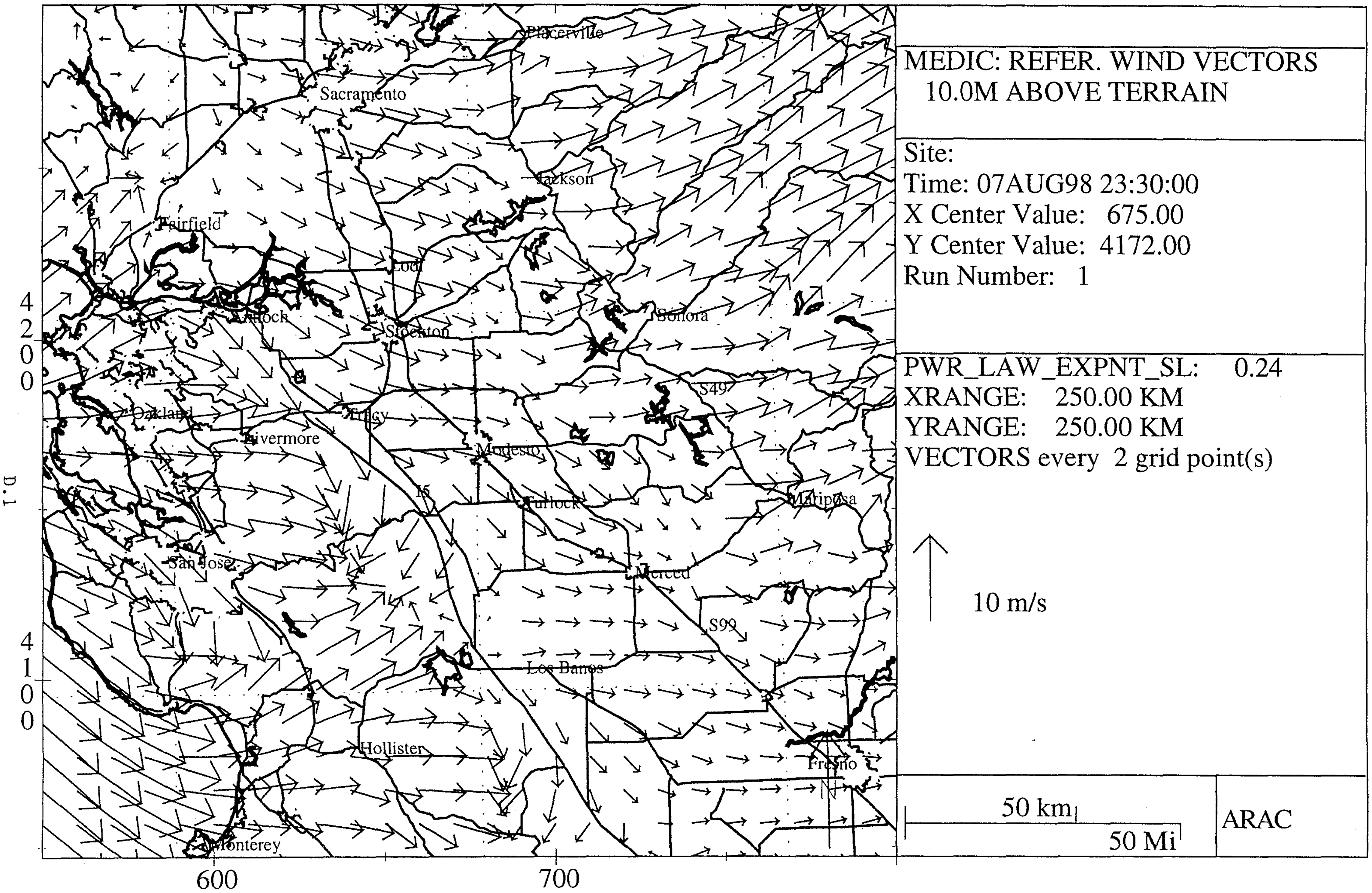
Plot Time

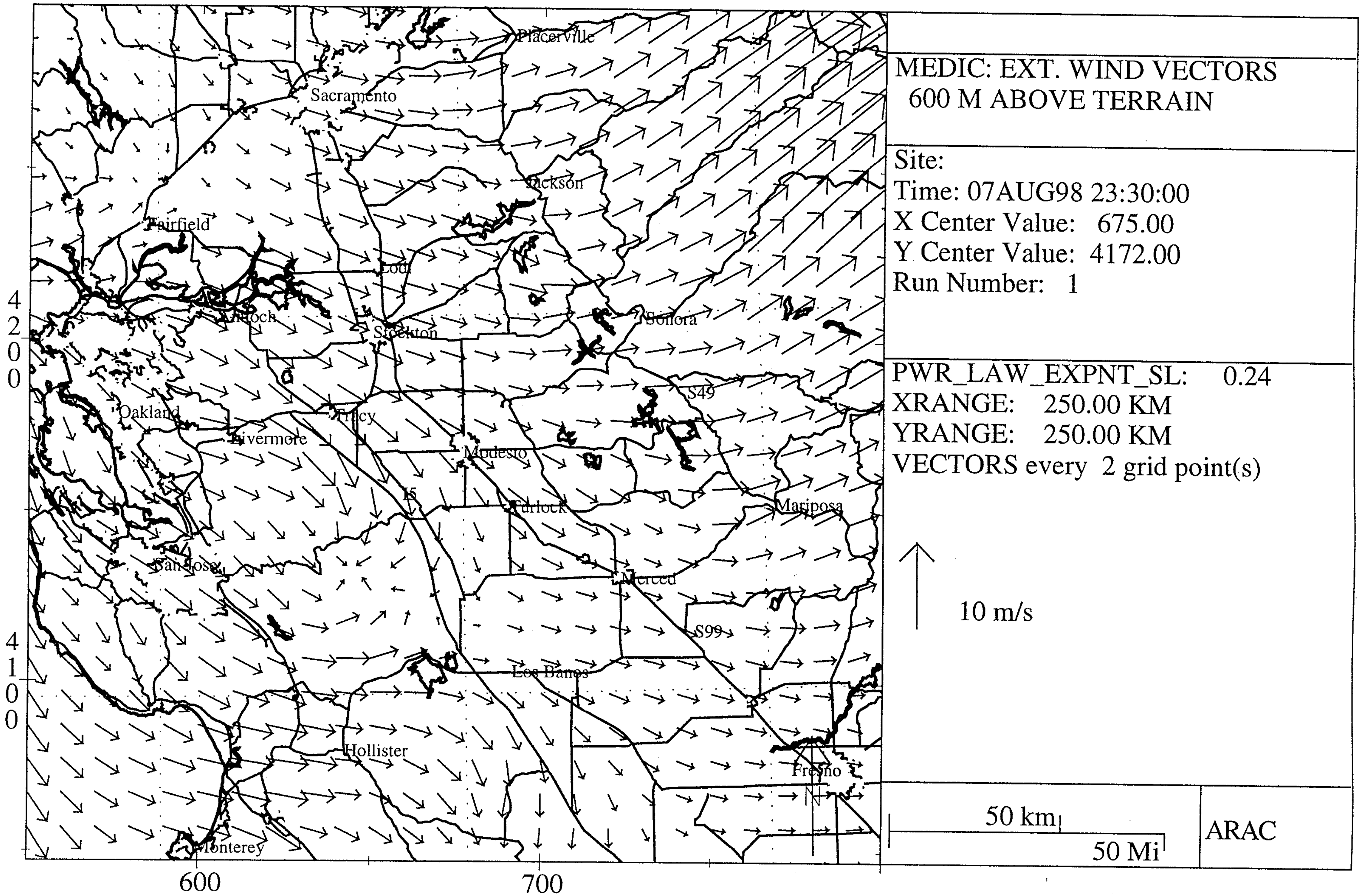
27-Aug-98 22:18:00

	STATION	DIR	M/S	AGE
1	KMRY	270	5.1	FUT
2	KSNS	290	8.0	NEW
3	KMCE	320	4.1	FUT
4	KRHV	310	5.0	NEW
5	KSJC	310	6.0	NEW
6	KNUQ	340	6.0	NEW
7	KPAO	350	6.0	NEW
8	KSQL	260	8.0	NEW
9	KSFO	250	9.0	NEW
10	KMOD	300	5.7	FUT
11	KHWD	290	6.0	NEW
12	KLVK	280	6.7	FUT
13	KOAK	270	4.1	FUT
14	KSCK	290	6.0	NEW
15	KCCR	200	6.2	FUT
16	KAPC	200	7.0	NEW
17	KSUU	230	9.0	NEW
18	KSAC	210	4.0	NEW
19	KSTS	160	6.0	NEW
20	KMCC	190	5.0	NEW
21	KSMF	180	6.0	NEW
22	SANDIA1	241	3.8	NEW
23	LIVELLNL	265	4.5	NEW

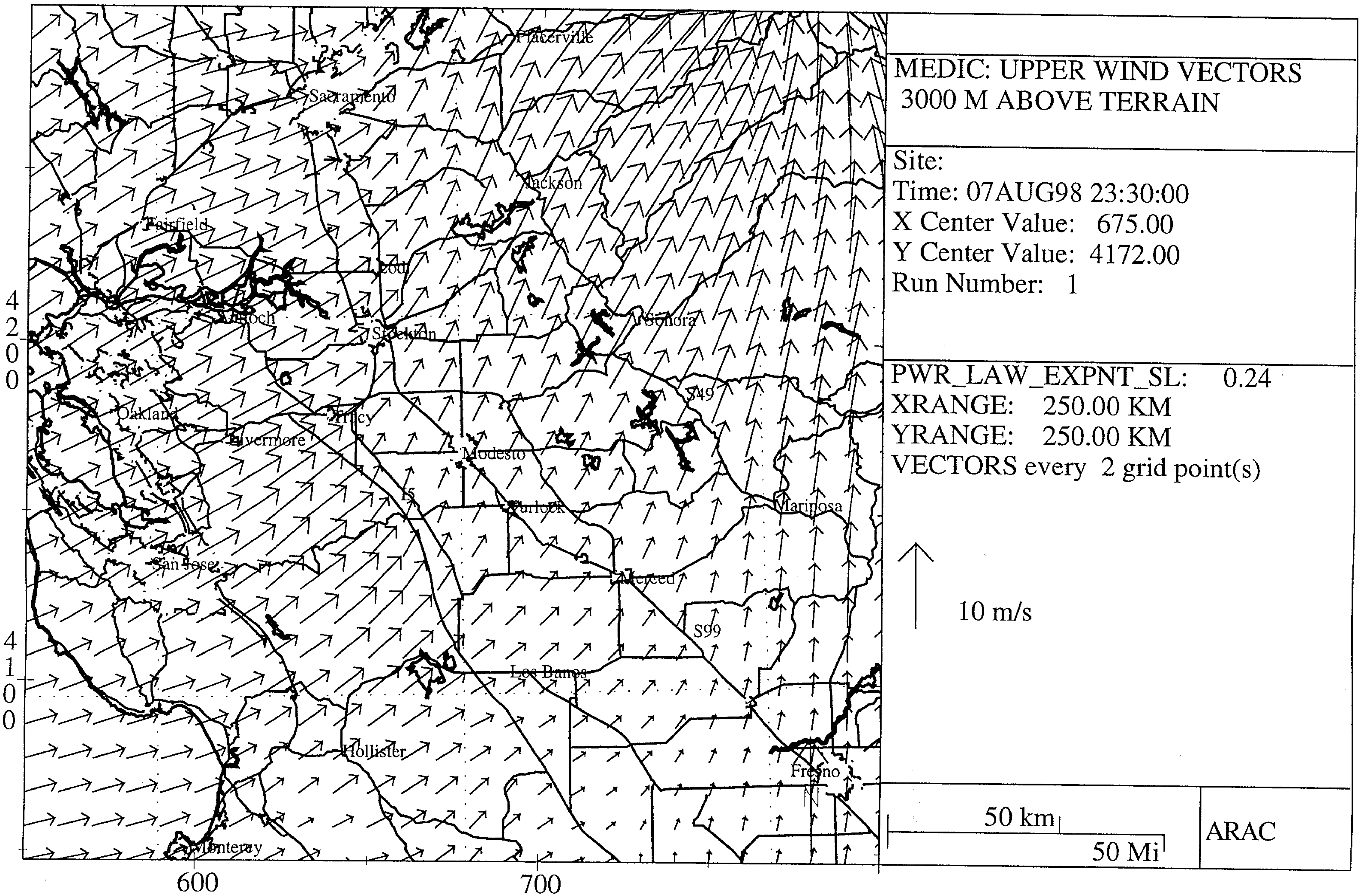

(KM) ASL / AGL
Station: KOAK
Lat:
37.7500 N
Long:
122.2167 W
Valid at
980808 0
700 mbar
850 mbar
925 mbar
1000 mbar
PRESSURE
TEMP (C)
D——D Dew Pt
T— —T Temp
P—·—P Pot Temp

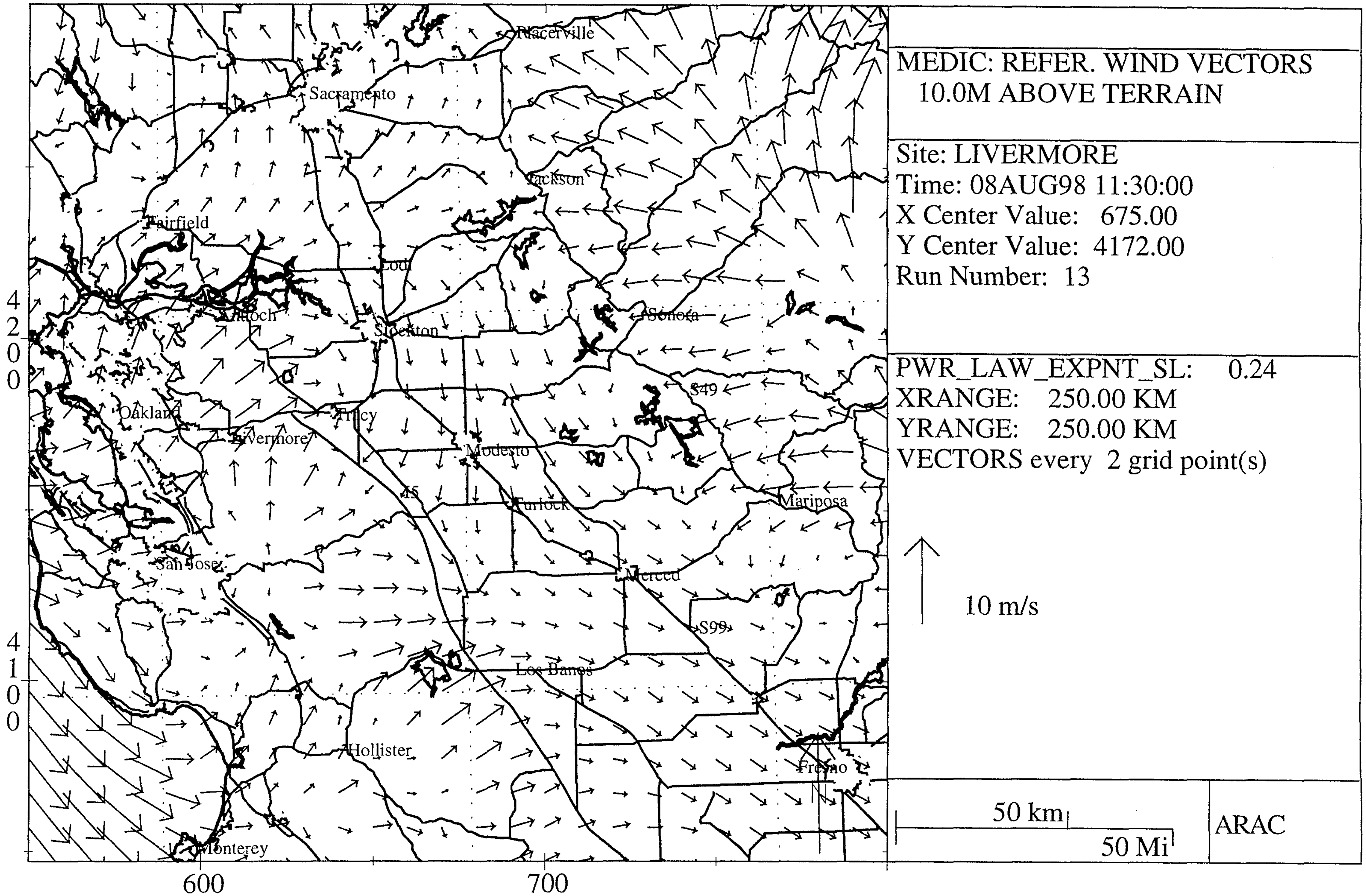
C.2


MEDIC: REFER. WIND VECTORS
10.0M ABOVE TERRAIN
Site:
Time: 07AUG98 23:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 1
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
Modesto
I5
Turlock
Mariposa
San Jose
Merced
S99
Los Banos
Hollister
Fresno
Monterey
4200
4100
600
700
D.1



MEDIC: EXT. WIND VECTORS
600 M ABOVE TERRAIN
Site:
Time: 07AUG98 23:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 1
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
Modesto
I5
Turlock
Mariposa
San Jose
Merced
S99
Los Banos
Hollister
Fresno
Monterey
4200
4100
600
700


MEDIC: UPPER WIND VECTORS
3000 M ABOVE TERRAIN
Site:
Time: 07AUG98 23:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 1
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
Modesto
I5
Turlock
Mariposa
San Jose
Merced
S99
Los Banos
Hollister
Fresno
Monterey
4200
4100
600
700


MEDIC: REFER. WIND VECTORS
10.0M ABOVE TERRAIN
Site: LIVERMORE
Time: 08AUG98 11:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 13
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
Modesto
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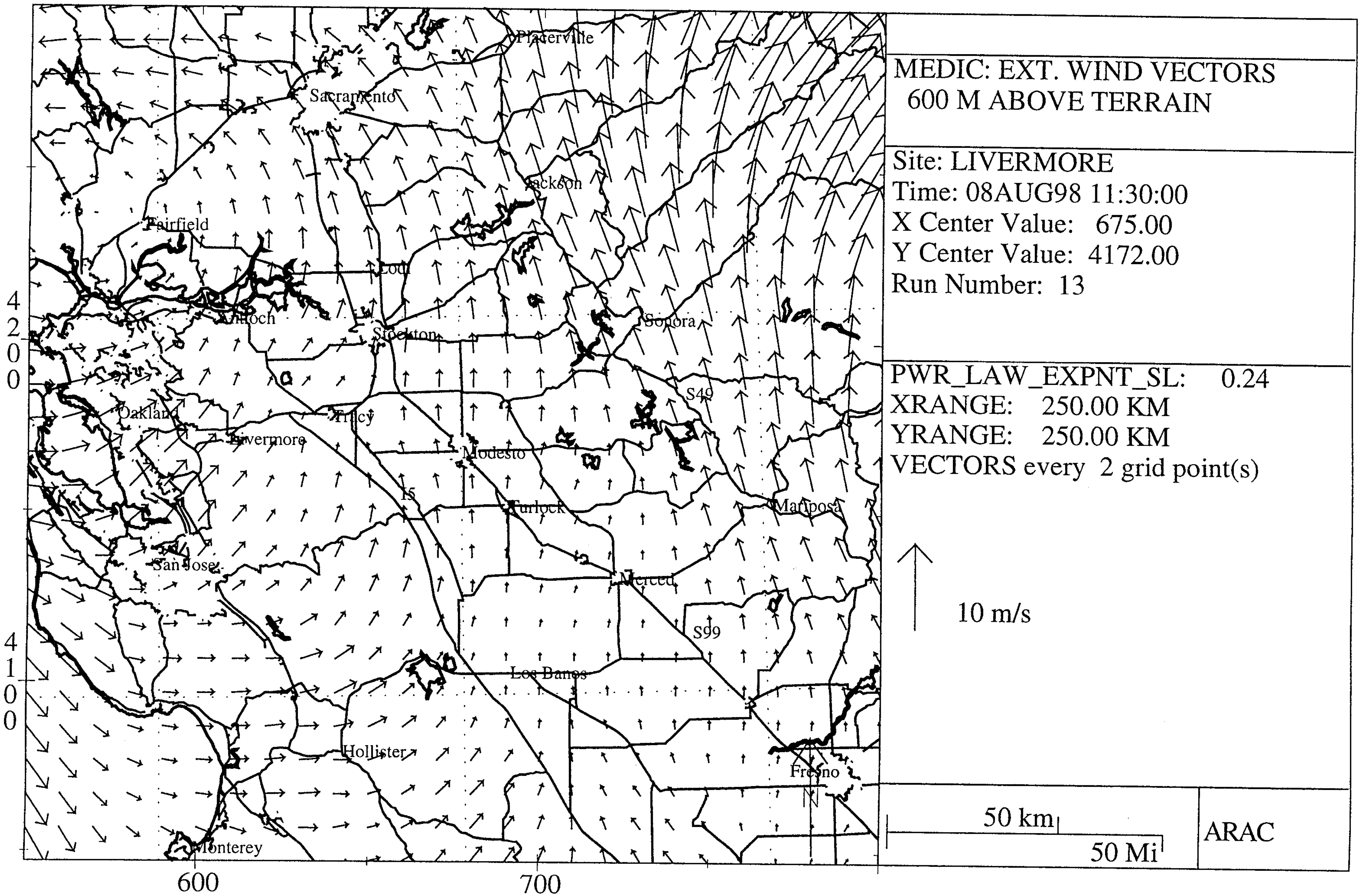
San Jose
Merced
S99
Los Banos
Hollister
Fresno
Monterey
4200
4100
600
700


MEDIC: EXT. WIND VECTORS
600 M ABOVE TERRAIN
Site: LIVERMORE
Time: 08AUG98 11:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 13
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
Modesto
I5
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4200
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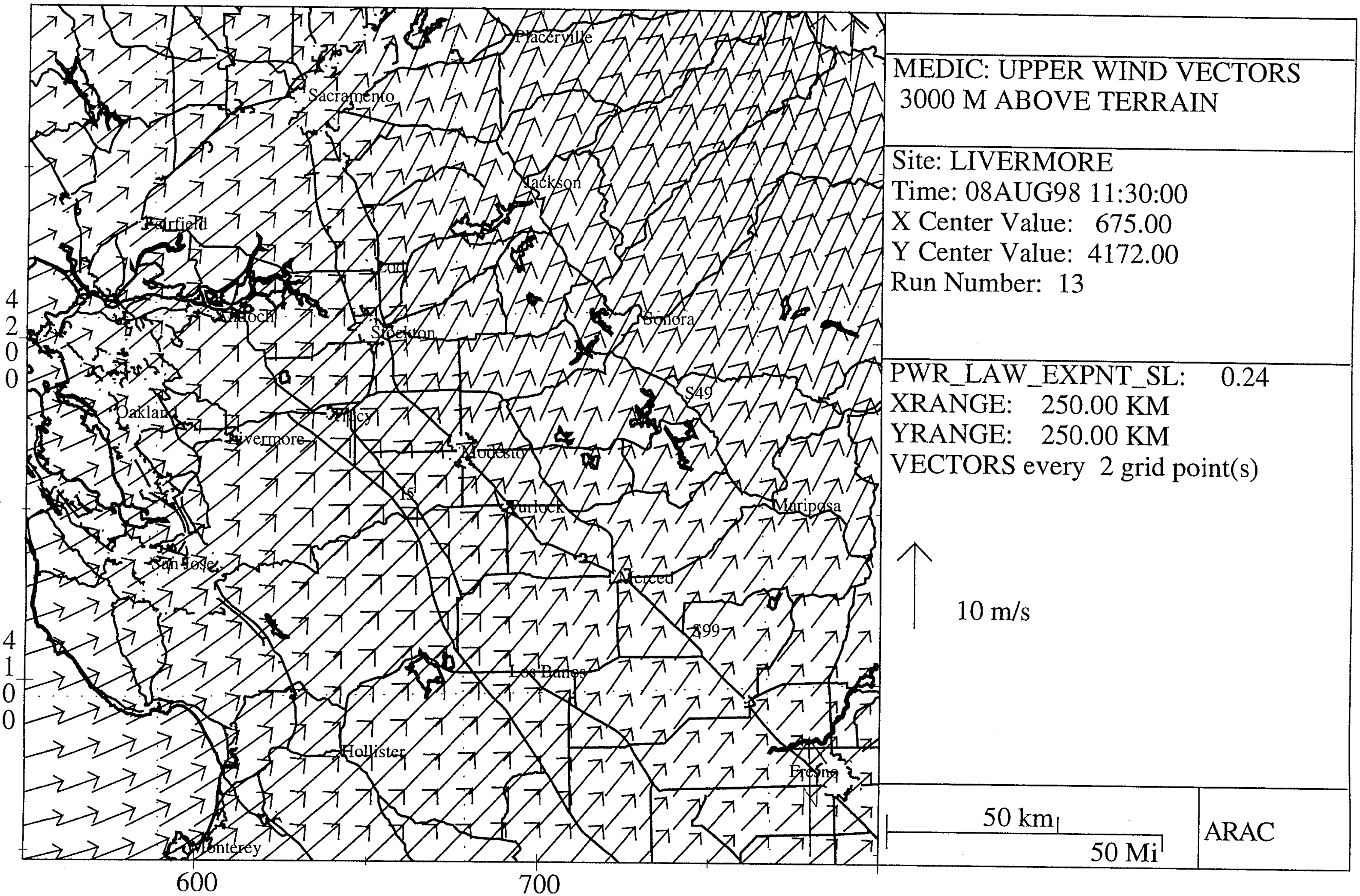
600
700


MEDIC: UPPER WIND VECTORS
3000 M ABOVE TERRAIN
Site: LIVERMORE
Time: 08AUG98 11:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 13
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
Modesto
I5
Turlock
Mariposa
San Jose
Merced
S99
Los Banos
Hollister
Fresno
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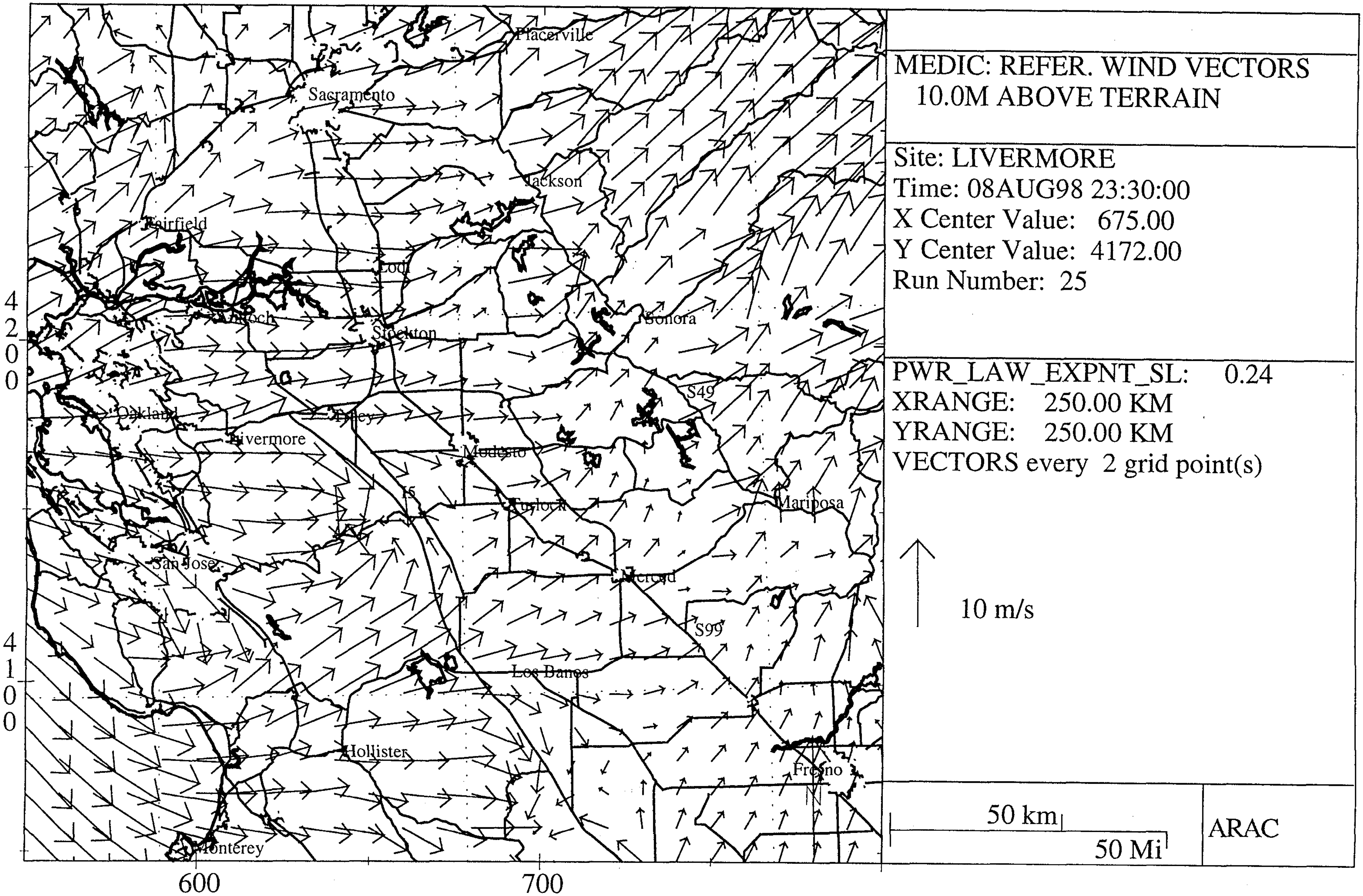
4200
4100
600
700


MEDIC: REFER. WIND VECTORS
10.0M ABOVE TERRAIN
Site: LIVERMORE
Time: 08AUG98 23:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 25
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
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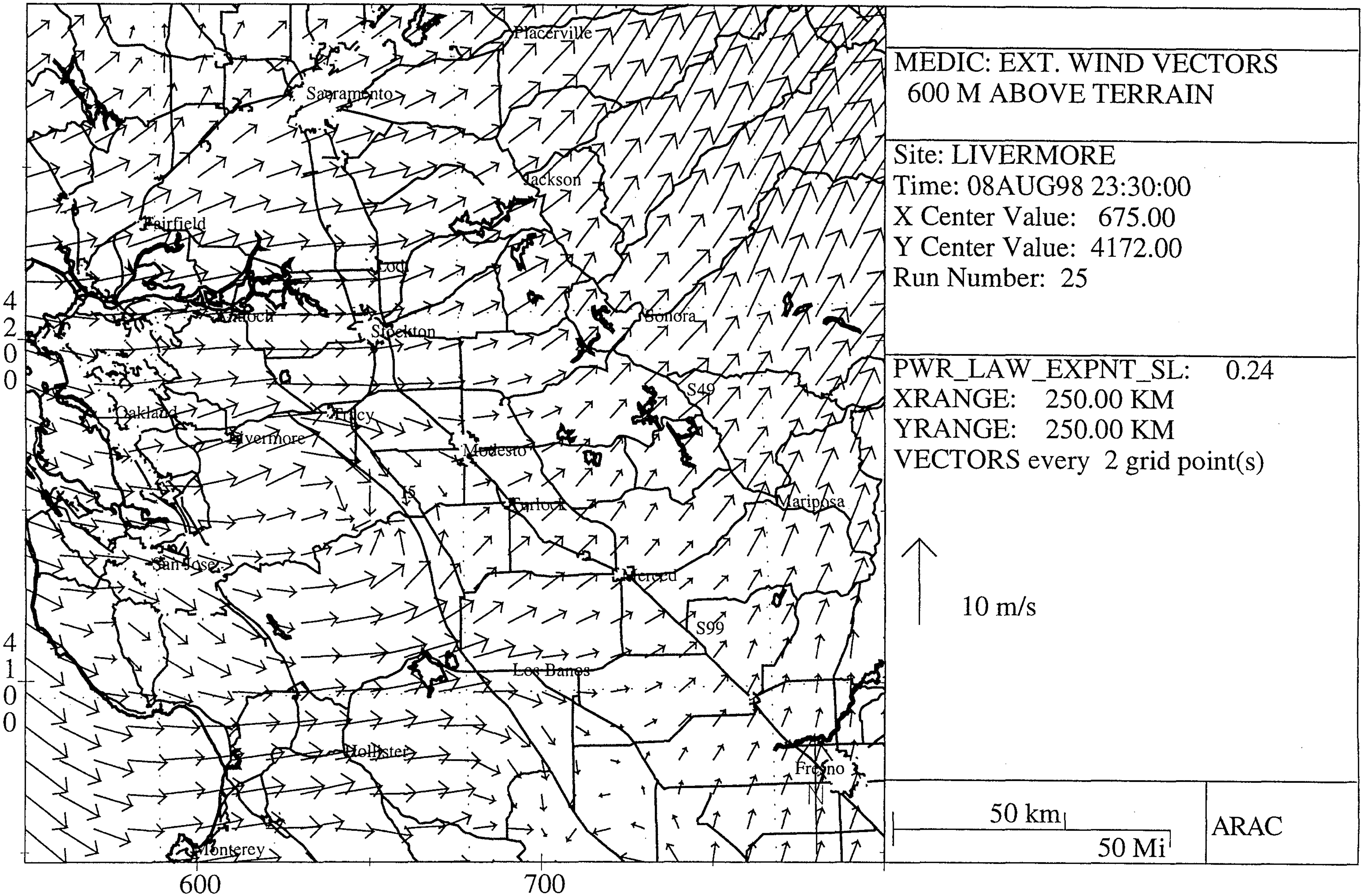
4200
4100
600
700



MEDIC: EXT. WIND VECTORS
600 M ABOVE TERRAIN
Site: LIVERMORE
Time: 08AUG98 23:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 25
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
Modesto
I5
Turlock
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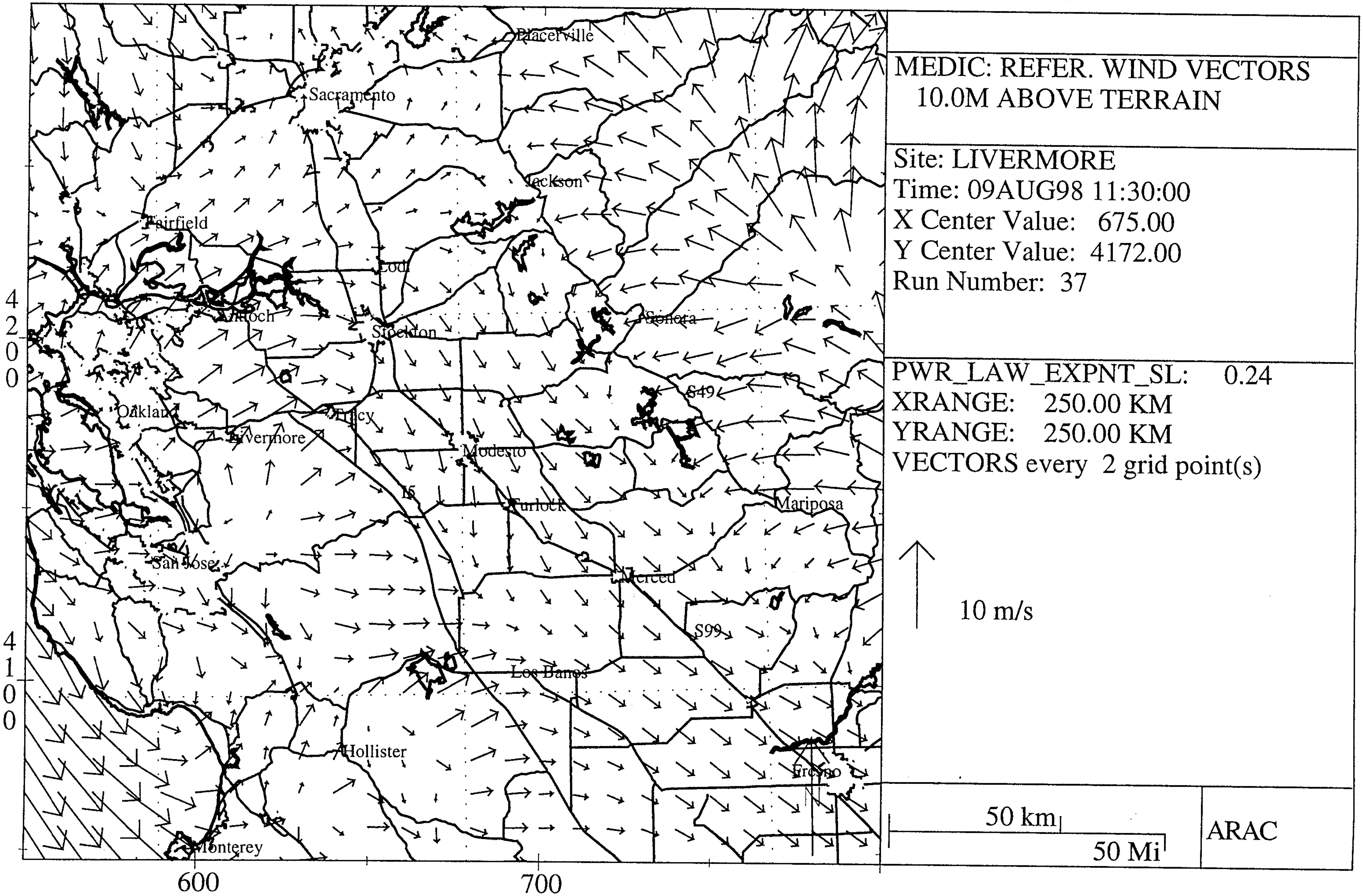
San Jose
Merced
S99
Los Banos
Hollister
Fresno
Monterey
4200
4100
600
700


MEDIC: REFER. WIND VECTORS
10.0M ABOVE TERRAIN
Site: LIVERMORE
Time: 09AUG98 11:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 37
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Stockton
Sonora
S49
Tracy
Livermore
Modesto
I5
Turlock
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S99
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Fresno
Monterey
4200
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600
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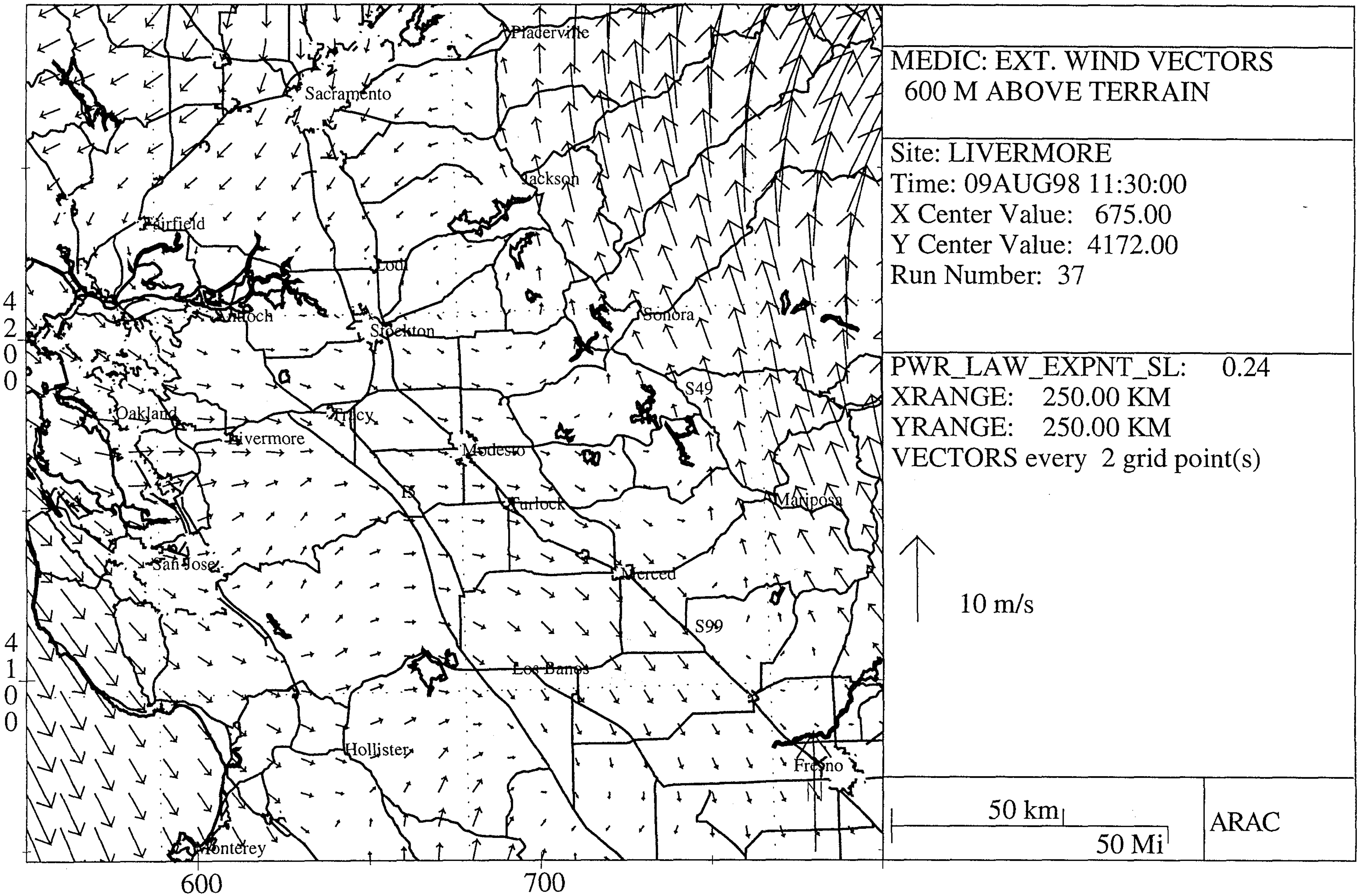

MEDIC: EXT. WIND VECTORS
600 M ABOVE TERRAIN
Site: LIVERMORE
Time: 09AUG98 11:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 37
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
Modesto
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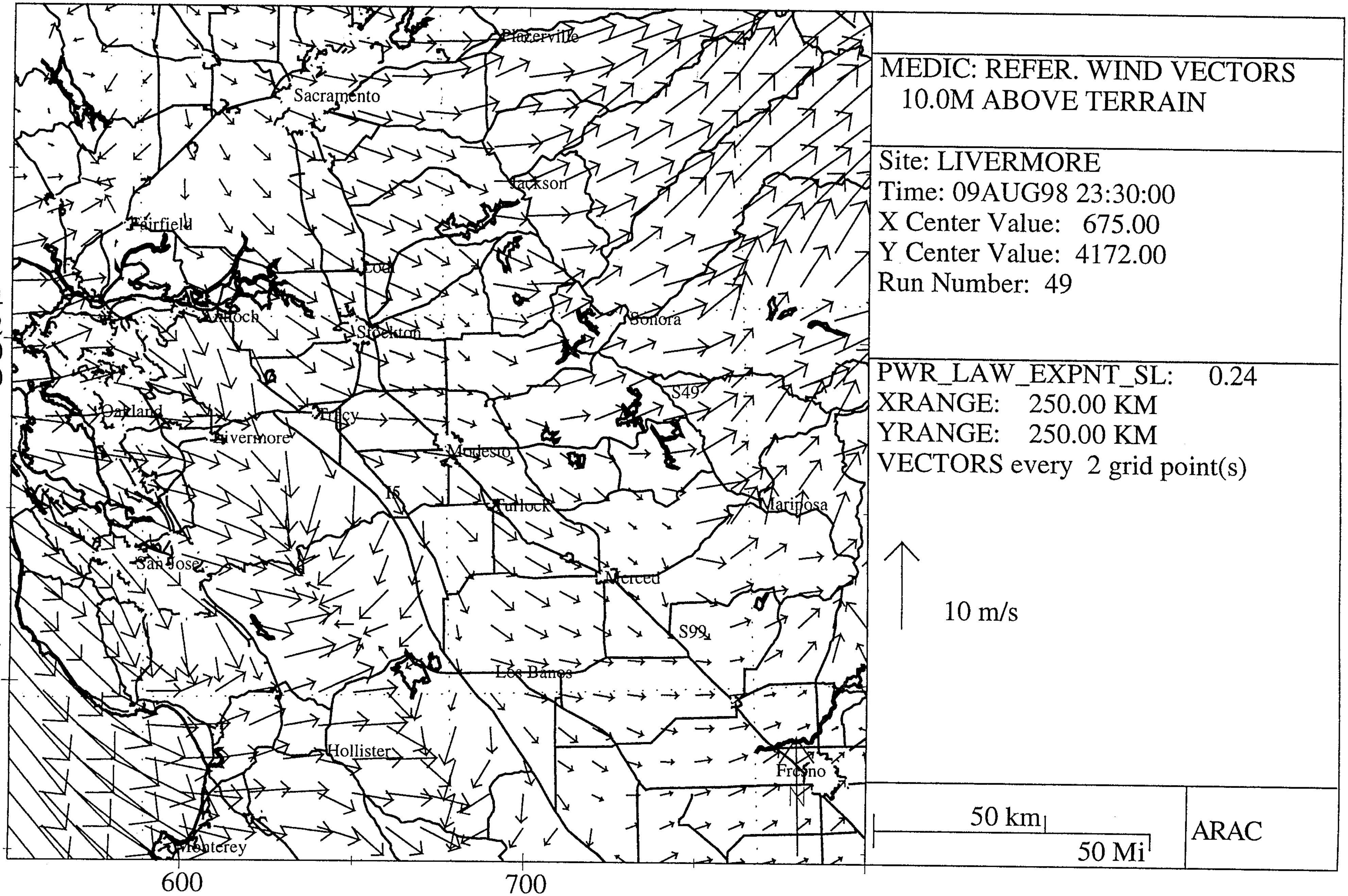
San Jose
Merced
S99
Los Banos
Hollister
Fresno
Monterey
4200
4100
600
700


Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
Modesto
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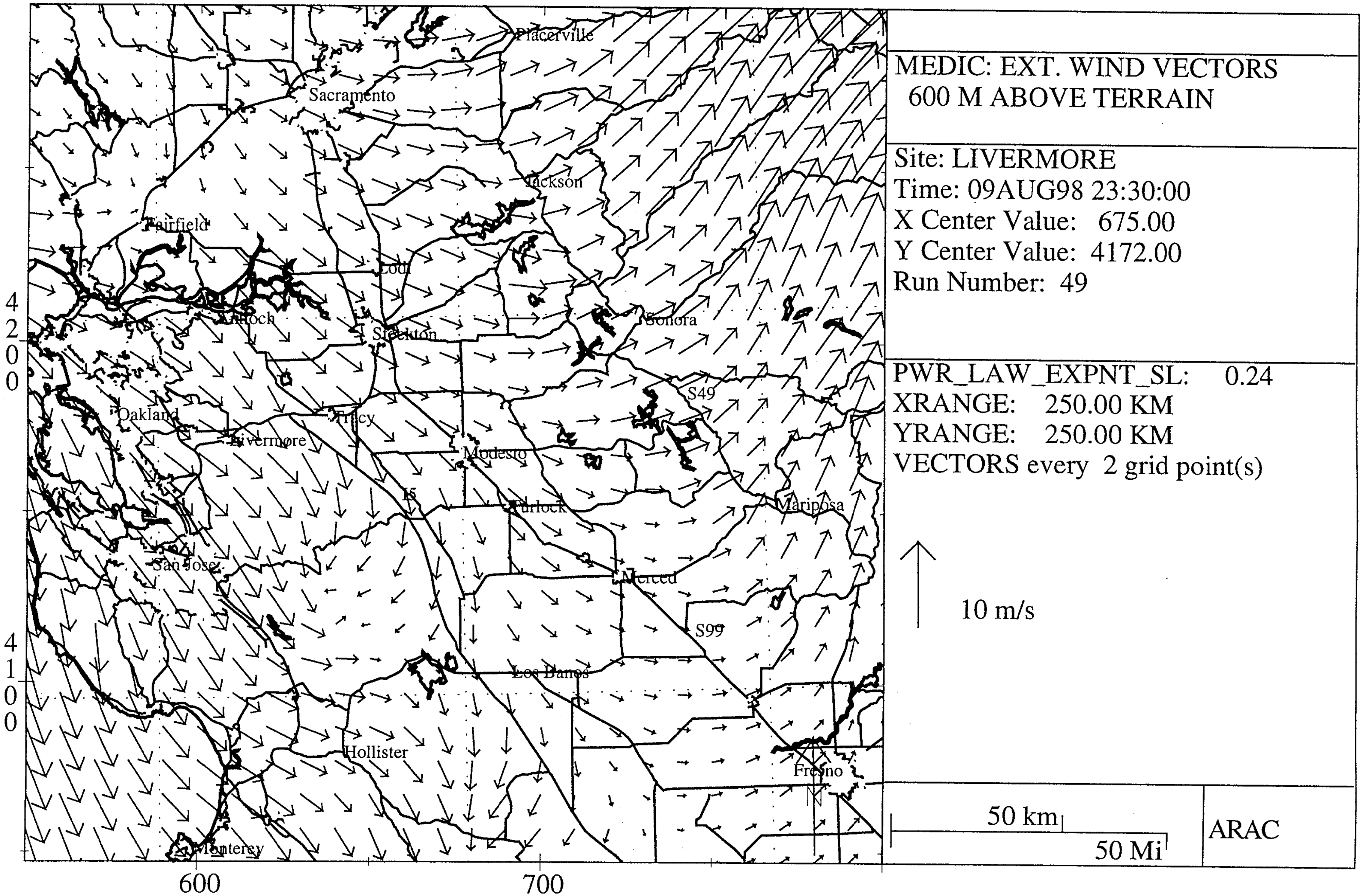
Turlock
Mariposa
San Jose
Merced
S99
Los Banos
Hollister
Fresno
Monterey
4200
4100
600
700
MEDIC: REFER. WIND VECTORS
10.0M ABOVE TERRAIN
Site: LIVERMORE
Time: 09AUG98 23:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 49
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC

D.11


MEDIC: EXT. WIND VECTORS
600 M ABOVE TERRAIN
Site: LIVERMORE
Time: 09AUG98 23:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 49
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
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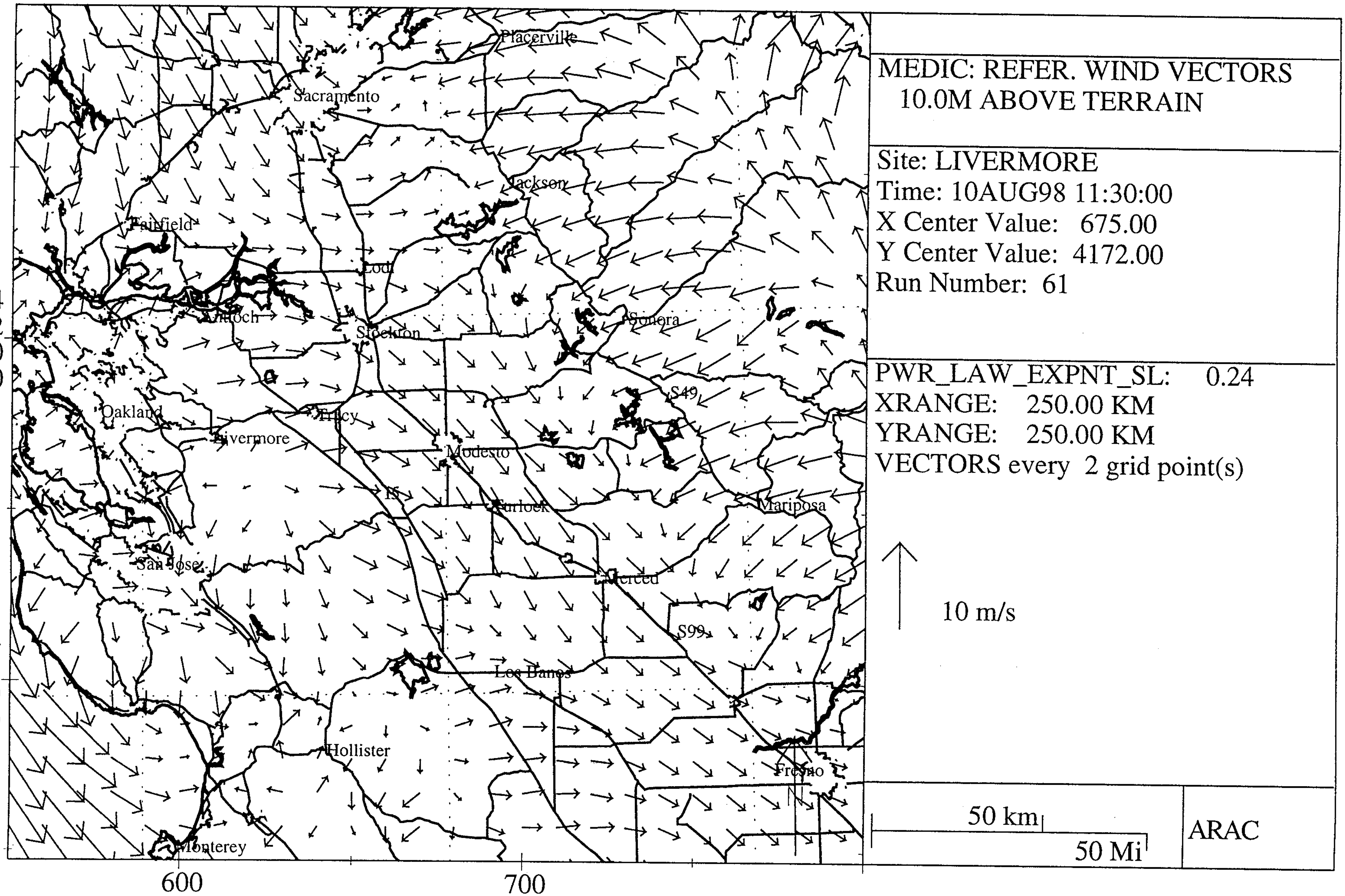
MEDIC: REFER. WIND VECTORS
10.0M ABOVE TERRAIN
Site: LIVERMORE
Time: 10AUG98 11:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 61
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
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Hollister
Fresno
Monterey
4200
4100
600
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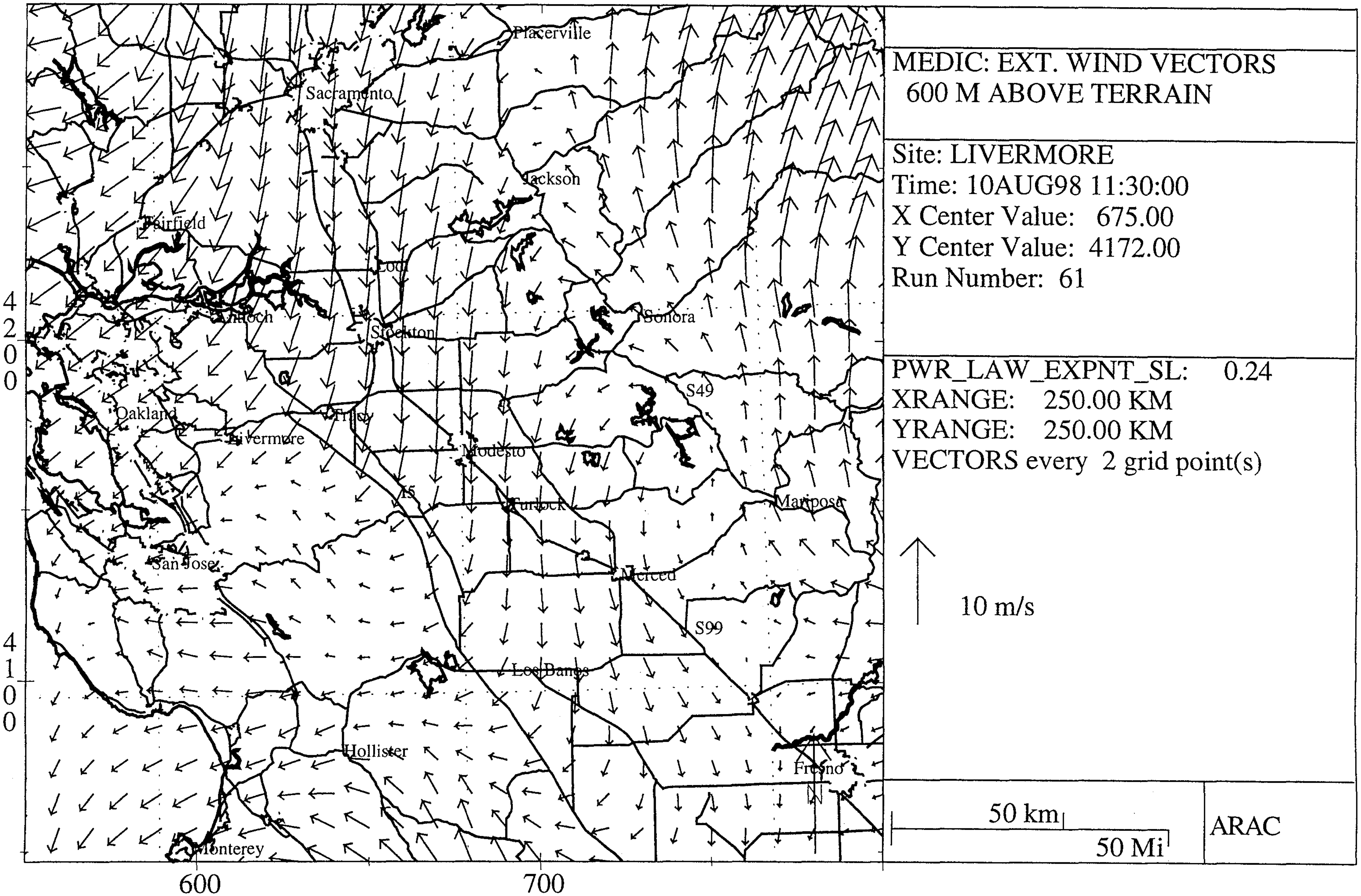
MEDIC: EXT. WIND VECTORS
600 M ABOVE TERRAIN
Site: LIVERMORE
Time: 10AUG98 11:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 61
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
Modesto
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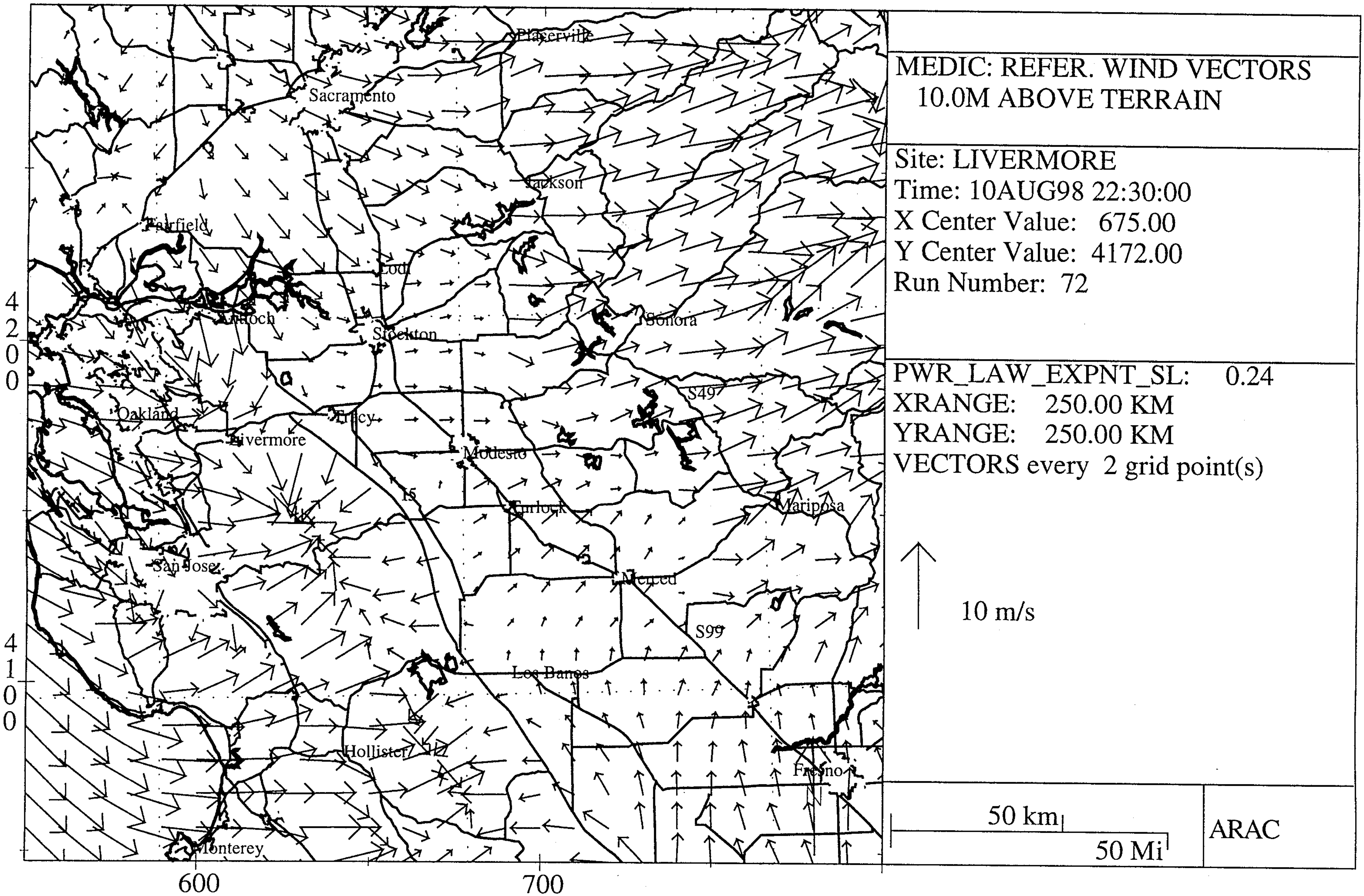
MEDIC: REFER. WIND VECTORS
10.0M ABOVE TERRAIN
Site: LIVERMORE
Time: 10AUG98 22:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 72
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
Modesto
I5
Turlock
Mariposa
San Jose
Merced
S99
Los Banos
Hollister
Fresno
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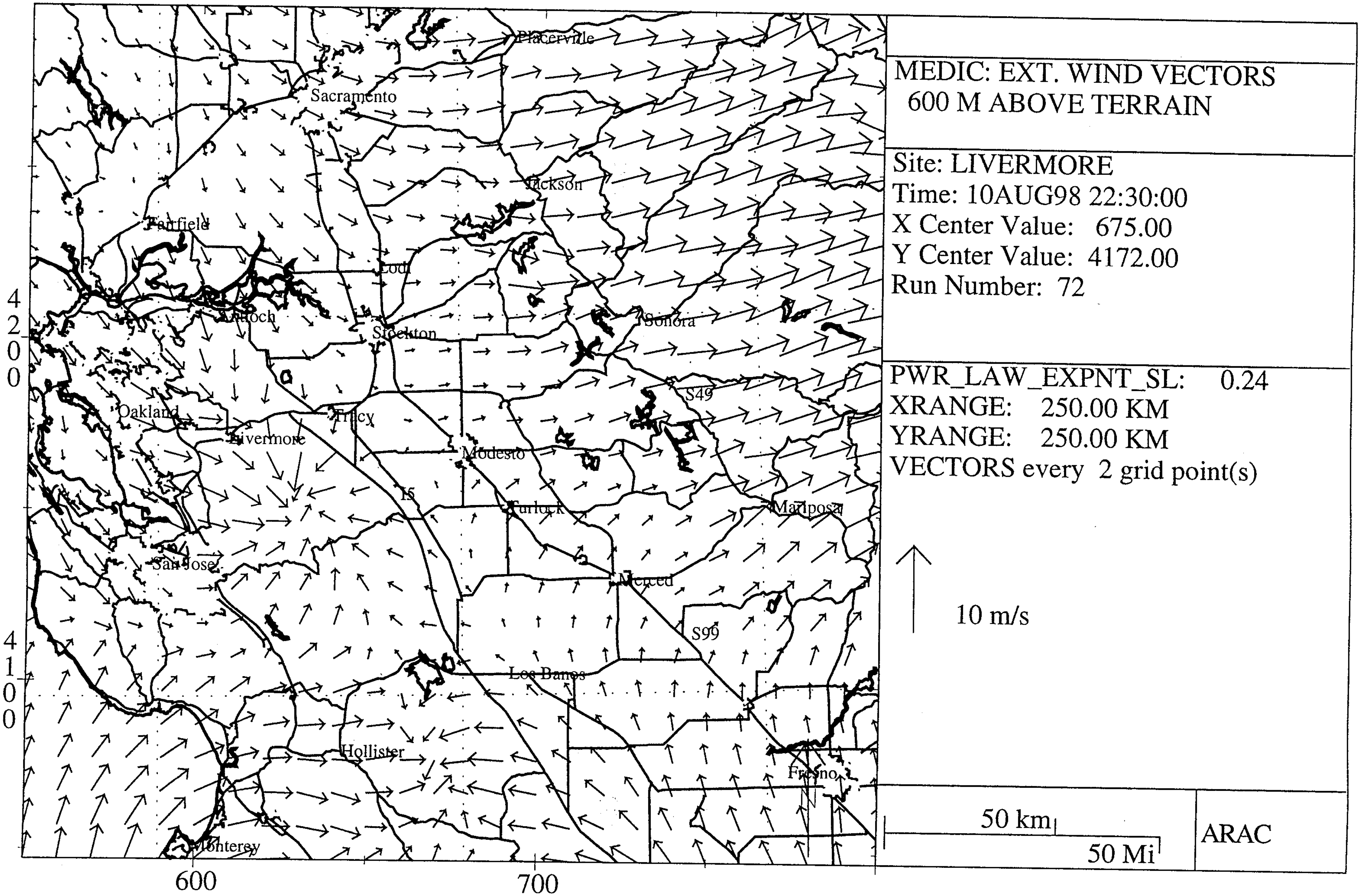
4200
4100
600
700


MEDIC: EXT. WIND VECTORS
600 M ABOVE TERRAIN
Site: LIVERMORE
Time: 10AUG98 22:30:00
X Center Value: 675.00
Y Center Value: 4172.00
Run Number: 72
PWR_LAW_EXPNT_SL: 0.24
XRANGE: 250.00 KM
YRANGE: 250.00 KM
VECTORS every 2 grid point(s)
10 m/s
50 km
50 Mi
ARAC
Placerville
Sacramento
Jackson
Fairfield
Lodi
Antioch
Stockton
Sonora
S49
Oakland
Tracy
Livermore
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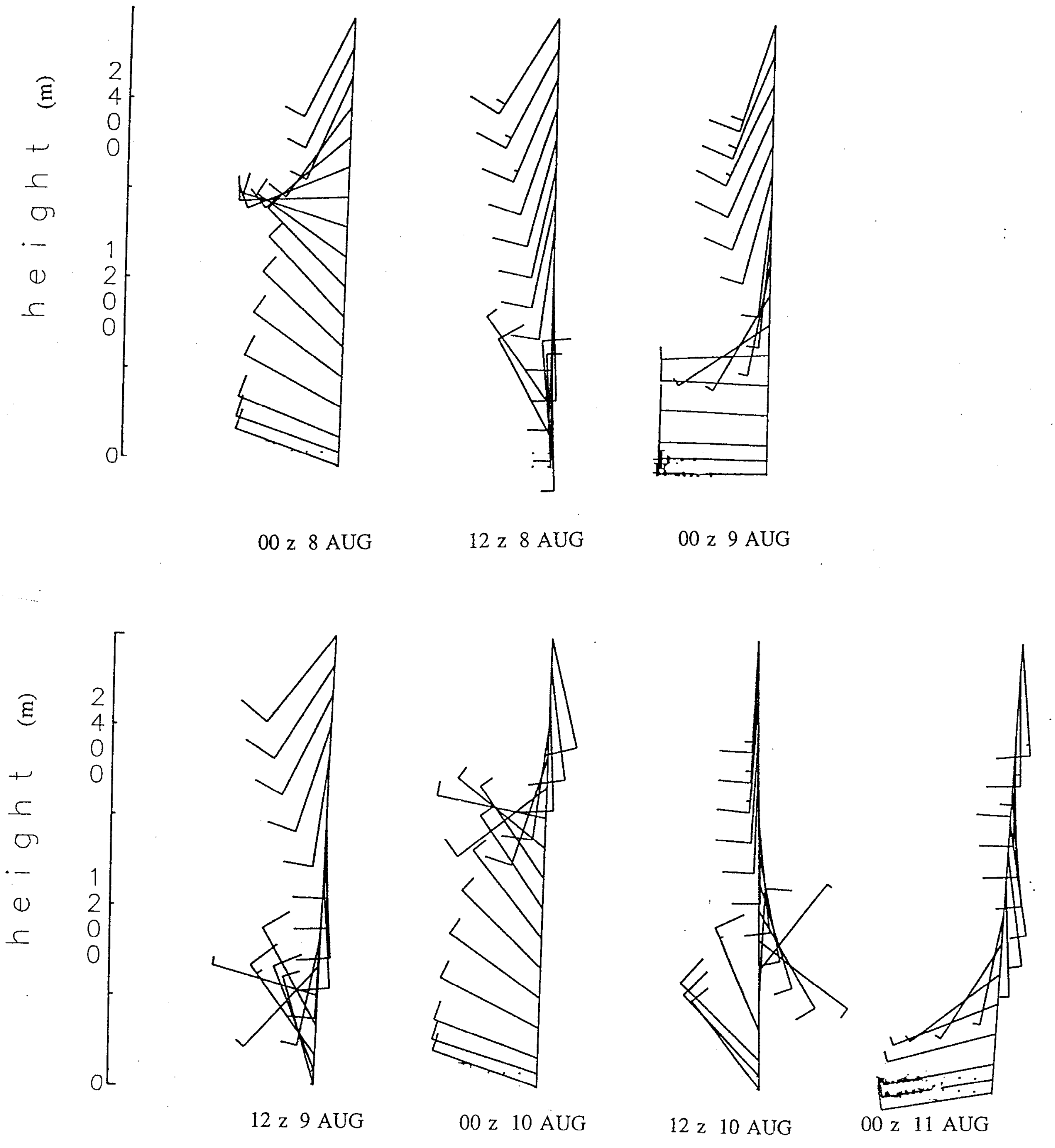
4200
4100
600
700



NORAPS wind direction and speed vertical profiles 50 km east of Tracy. A full barb equals 5 m/s.

NORAPS Forecast Profiles 50 km East of Release Location.

8-Aug-98 0:00 UTC

Height (m)	Direction (Deg)	Speed (m/s)
100	287	3.06
200	290	3.07
300	293	3.02
400	296	2.96
500	300	2.89
600	304	2.83
700	307	2.78
800	311	2.73
900	312	2.66
1000	314	2.60
1100	314	2.54
1200	313	2.48
1300	308	2.45
1400	303	2.43
1500	295	2.58
1600	286	2.87
1700	276	3.16
1800	267	3.33
1900	257	3.34
2000	247	3.35
2100	237	3.37
2200	229	3.25
2300	222	3.08
2400	215	2.90
2500	208	2.73
2600	203	2.61
2700	204	2.74
2800	204	2.86
2900	205	2.98
3000	206	3.11

8-Aug-98 6:00 UTC

Height (m)	Direction (Deg)	Speed (m/s)
100	295	6.47
200	299	7.26
300	308	5.90
400	315	4.69
500	321	3.42
600	333	1.96
700	42	1.33
800	103	0.94
900	125	1.00
1000	151	1.07
1100	186	1.13
1200	205	1.24
1300	198	1.44
1400	190	1.63
1500	191	2.12
1600	193	2.66
1700	195	3.19
1800	197	3.69
1900	198	4.17
2000	199	4.65
2100	200	5.14
2200	202	5.52
2300	204	5.90
2400	206	6.28
2500	208	6.66
2600	209	6.99
2700	210	7.29
2800	211	7.59
2900	212	7.89
3000	213	8.19

8-Aug-98 12:00 UTC

Height (m)	Direction (Deg)	Speed (m/s)
100	355	3.91
200	331	3.97
300	321	3.20
400	324	1.65
500	224	0.49
600	178	1.74
700	178	2.15
800	180	2.47
900	182	2.67
1000	181	2.88
1100	179	3.07
1200	178	3.26
1300	179	3.43
1400	181	3.61
1500	184	3.76
1600	187	3.92
1700	190	4.07
1800	191	4.25
1900	191	4.42
2000	192	4.60
2100	192	4.78
2200	194	4.94
2300	196	5.11
2400	198	5.27
2500	200	5.44
2600	202	5.63
2700	205	5.84
2800	207	6.05
2900	209	6.26
3000	211	6.47

9-Aug-98 00:00 UTC

Height (m)	Direction (Deg)	Speed (m/s)
100	270	4.37
200	271	4.22
300	271	3.92
400	272	3.53
500	272	3.10
600	272	2.66
700	270	2.22
800	267	1.79
900	252	1.49
1000	237	1.22
1100	224	1.16
1200	211	1.12
1300	201	1.25
1400	191	1.38
1500	186	1.57
1600	185	1.81
1700	184	2.04
1800	186	2.40
1900	190	2.89
2000	195	3.37
2100	199	3.85
2200	201	4.27
2300	203	4.68
2400	204	5.08
2500	205	5.48
2600	206	5.84
2700	204	6.13
2800	202	6.41
2900	200	6.70
3000	198	6.98

9-Aug-98 12:00 UTC

Height (m)	Direction (Deg)	Speed (m/s)
100	335	4.31
200	321	5.96
300	321	5.77
400	328	4.37
500	324	2.28
600	283	1.13
700	249	1.20
800	221	1.39
900	202	1.80
1000	190	2.36
1100	185	3.16
1200	181	3.76
1300	177	4.11
1400	174	4.46
1500	174	4.63
1600	174	4.80
1700	175	4.97
1800	176	4.82
1900	178	4.63
2000	179	4.43
2100	181	4.25
2200	186	4.20
2300	191	4.15
2400	196	4.11
2500	201	4.06
2600	205	4.23
2700	208	4.51
2800	211	4.79
2900	214	5.06
3000	217	5.34

10-Aug-98 00:00 UTC

Height (m)	Direction (Deg)	Speed (m/s)
100	286	2.73
200	289	2.71
300	292	2.65
400	296	2.57
500	300	2.49
600	304	2.43
700	309	2.38
800	313	2.34
900	316	2.29
1000	320	2.25
1100	322	2.18
1200	324	2.12
1300	324	2.04
1400	323	1.96
1500	317	1.89
1600	307	1.82
1700	297	1.76
1800	280	1.98
1900	256	2.49
2000	231	2.99
2100	207	3.50
2200	197	3.82
2300	192	4.09
2400	186	4.36
2500	181	4.63
2600	176	4.84
2700	174	4.94
2800	171	5.04
2900	168	5.14
3000	165	5.24

10-Aug-98 12:00 UTC

Height (m)	Direction (Deg)	Speed (m/s)
100	316	5.37
200	314	7.25
300	322	6.44
400	336	5.80
500	351	5.13
600	3	3.83
700	17	2.06
800	39	0.76
900	88	1.06
1000	127	1.56
1100	139	2.53
1200	149	3.11
1300	156	2.88
1400	162	2.66
1500	166	2.80
1600	169	3.04
1700	172	3.27
1800	174	3.52
1900	177	3.77
2000	179	4.01
2100	182	4.26
2200	183	4.55
2300	183	4.83
2400	184	5.11
2500	185	5.39
2600	185	5.62
2700	185	5.77
2800	184	5.93
2900	184	6.08
3000	184	6.23

11-Aug-98 00:00 UTC

Height (m)	Direction (Deg)	Speed (m/s)
100	257	1.71
200	256	1.64
300	255	1.55
400	252	1.44
500	249	1.32
600	245	1.20
700	238	1.09
800	230	0.99
900	219	0.95
1000	209	0.91
1100	199	0.95
1200	188	0.99
1300	181	1.11
1400	175	1.22
1500	170	1.40
1600	169	1.64
1700	168	1.89
1800	168	2.26
1900	170	2.86
2000	171	3.47
2100	173	4.08
2200	175	4.64
2300	176	5.18
2400	178	5.71
2500	179	6.24
2600	180	6.68
2700	178	6.40
2800	176	6.11
2900	174	5.83
3000	172	5.55

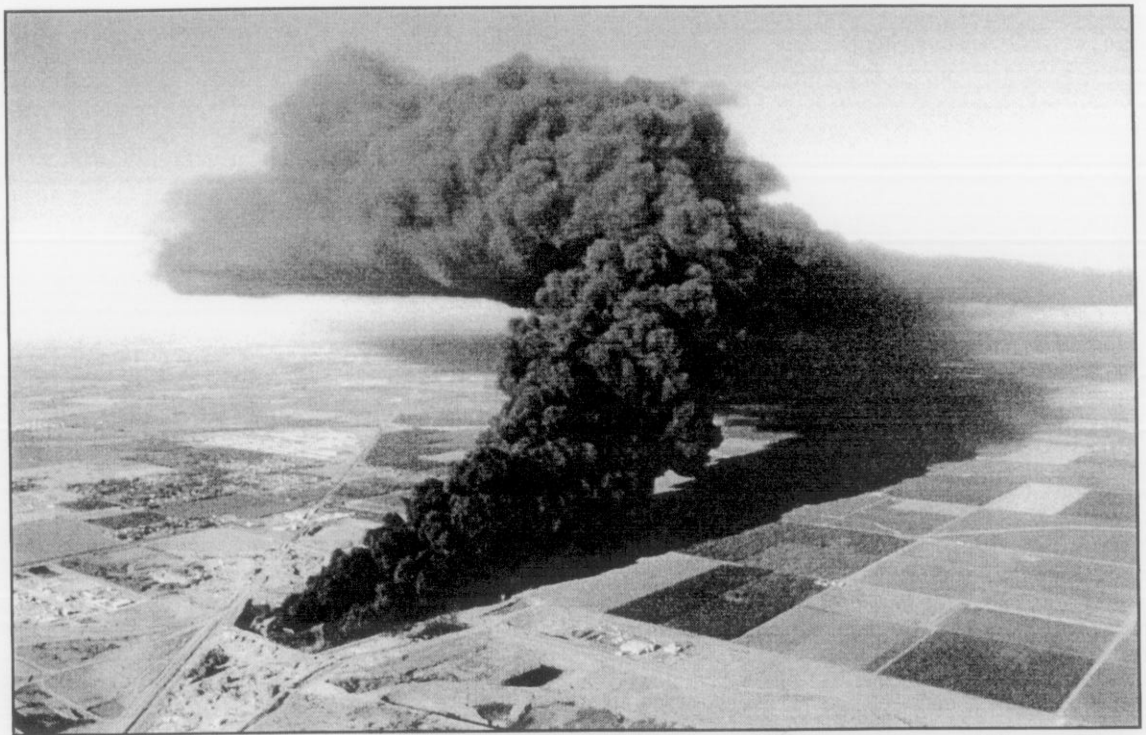
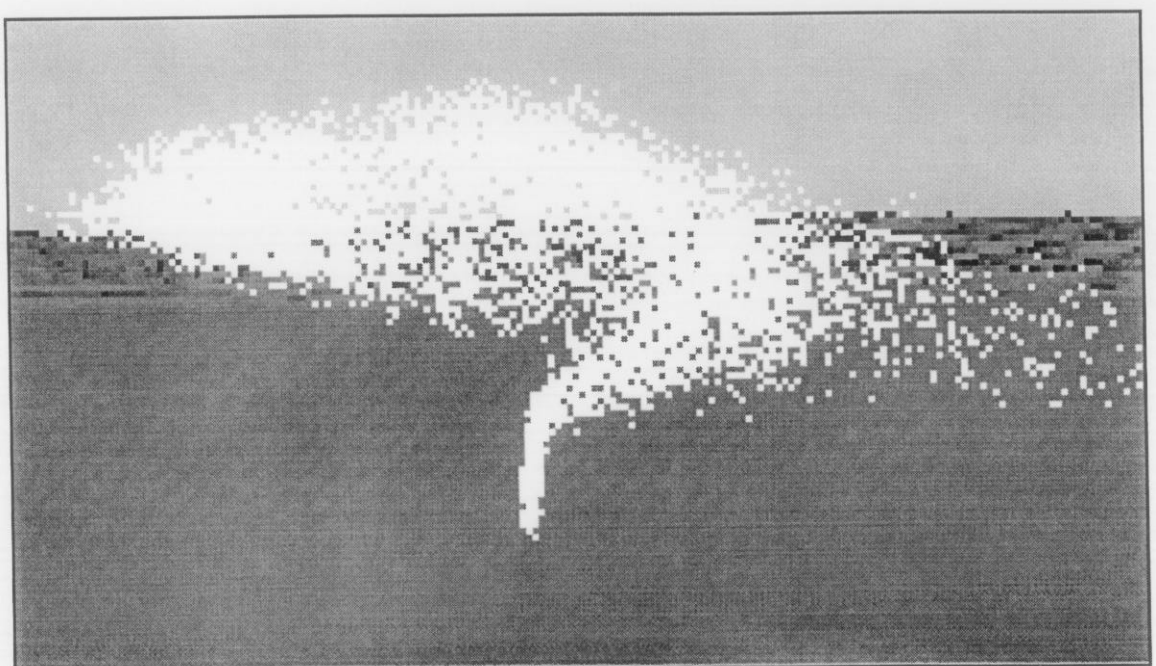


Photo courtesy of *Tracy Press*

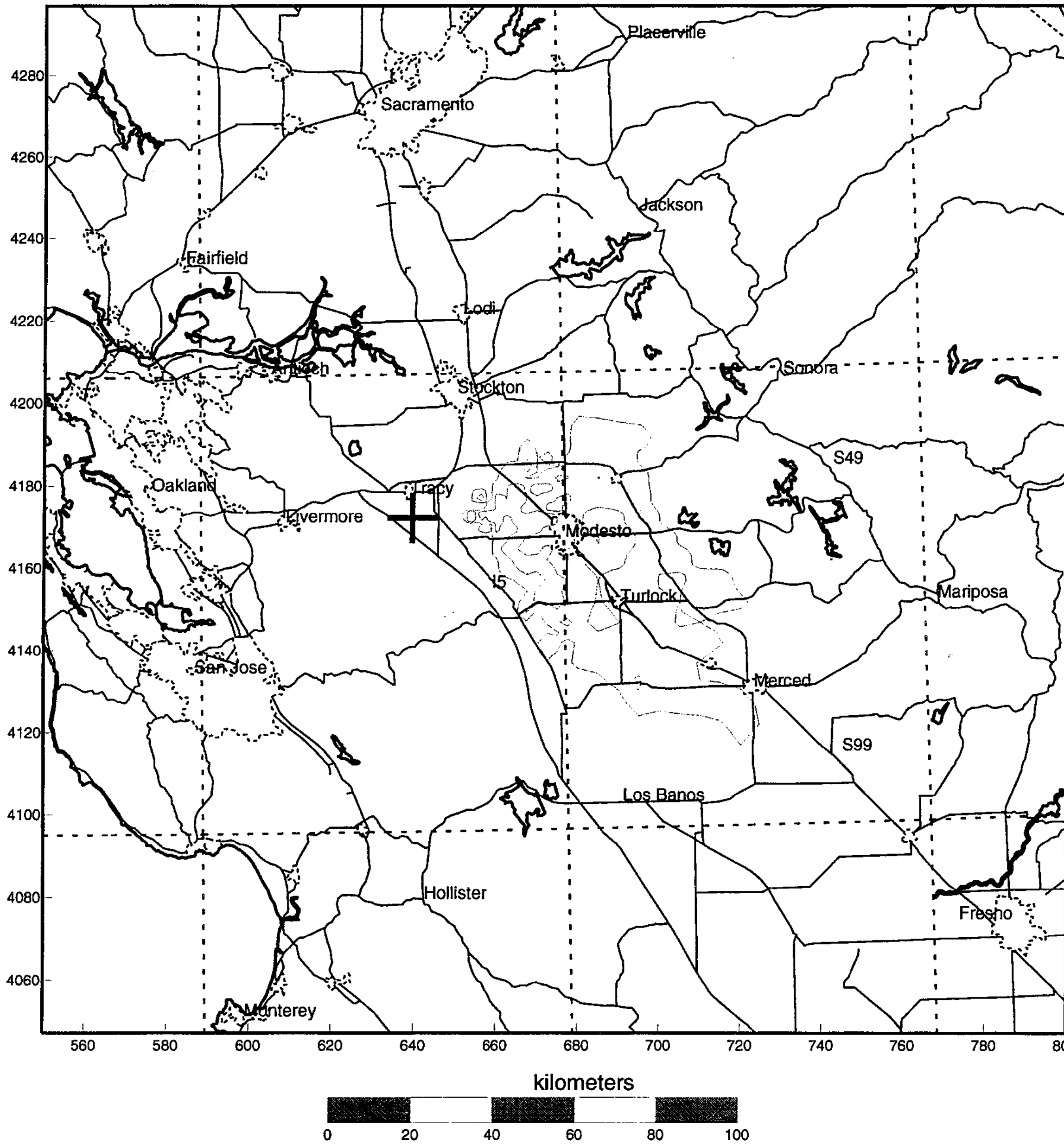


ARAC Plot

Comparison of ARAC model with photo of initial plume

SET 3: Instantaneous Air Concentration

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
Instantaneous air at 1.5 meters
08AUG98 05:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

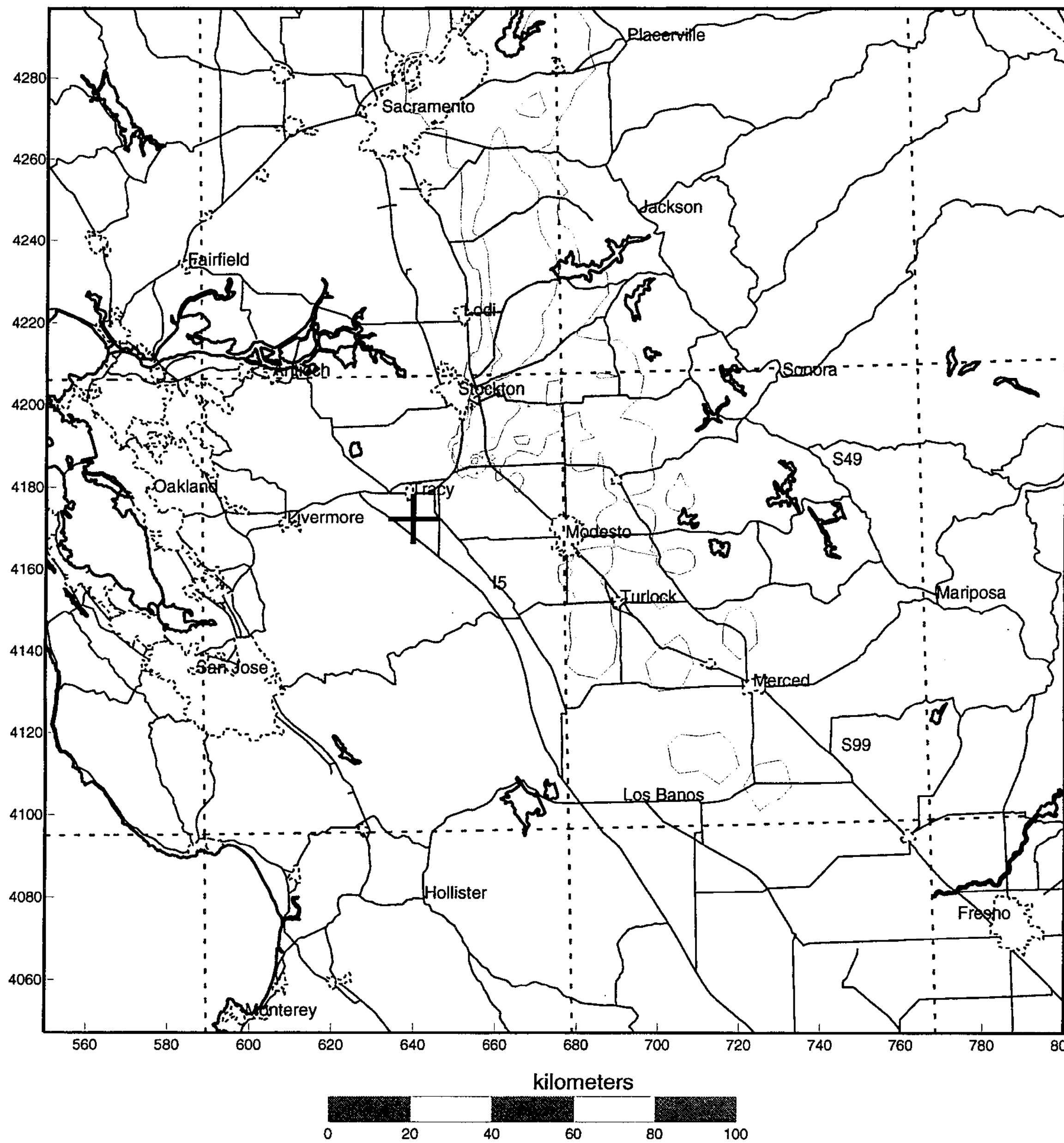
Contours:
(Level and Area Covered)

>	1.00e-07 1/m3	0.30 sq km
>	1.00e-08 1/m3	0.62 sq km
>	1.00e-09 1/m3	466.37 sq km
>	1.00e-10 1/m3	2712.26 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0001

SET 3: Instantaneous Air Concentration

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
Instantaneous air at 1.5 meters
08AUG98 11:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

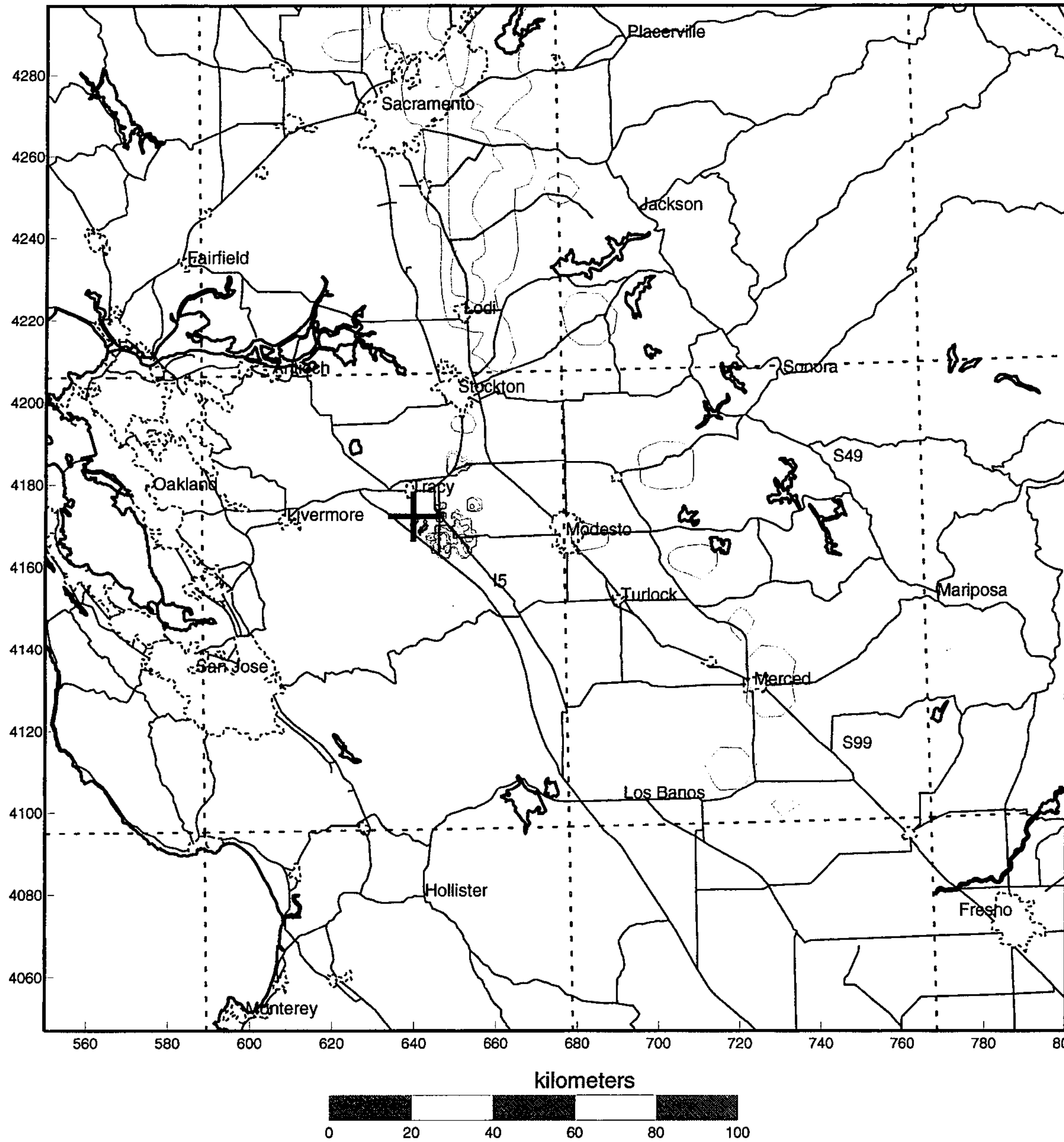
Contours:
(Level and Area Covered)

>	1.00e-07 1/m3	0.17 sq km
>	1.00e-08 1/m3	0.61 sq km
>	1.00e-09 1/m3	924.75 sq km
>	1.00e-10 1/m3	4827.41 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0003

SET 3: Instantaneous Air Concentration

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
Instantaneous air at 1.5 meters
08AUG98 17:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

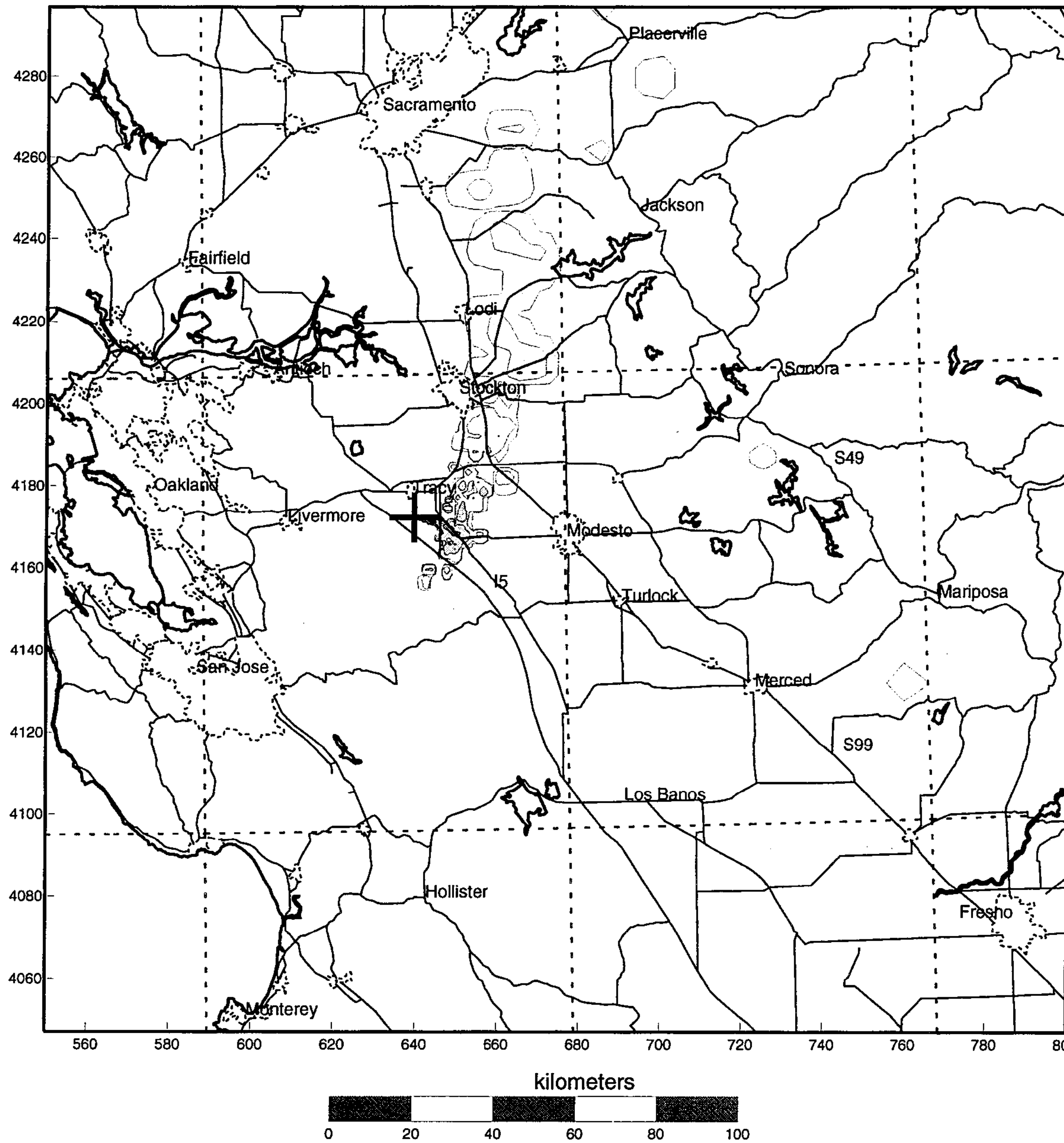
Contours:
(Level and Area Covered)

Level	Area Covered
> 1.00e-06 1/m3	0.13 sq km
> 1.00e-07 1/m3	4.87 sq km
> 1.00e-08 1/m3	43.97 sq km
> 1.00e-09 1/m3	661.28 sq km
> 1.00e-10 1/m3	2983.95 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0004

SET 3: Instantaneous Air Concentration

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
Instantaneous air at 1.5 meters
08AUG98 23:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

Contours:

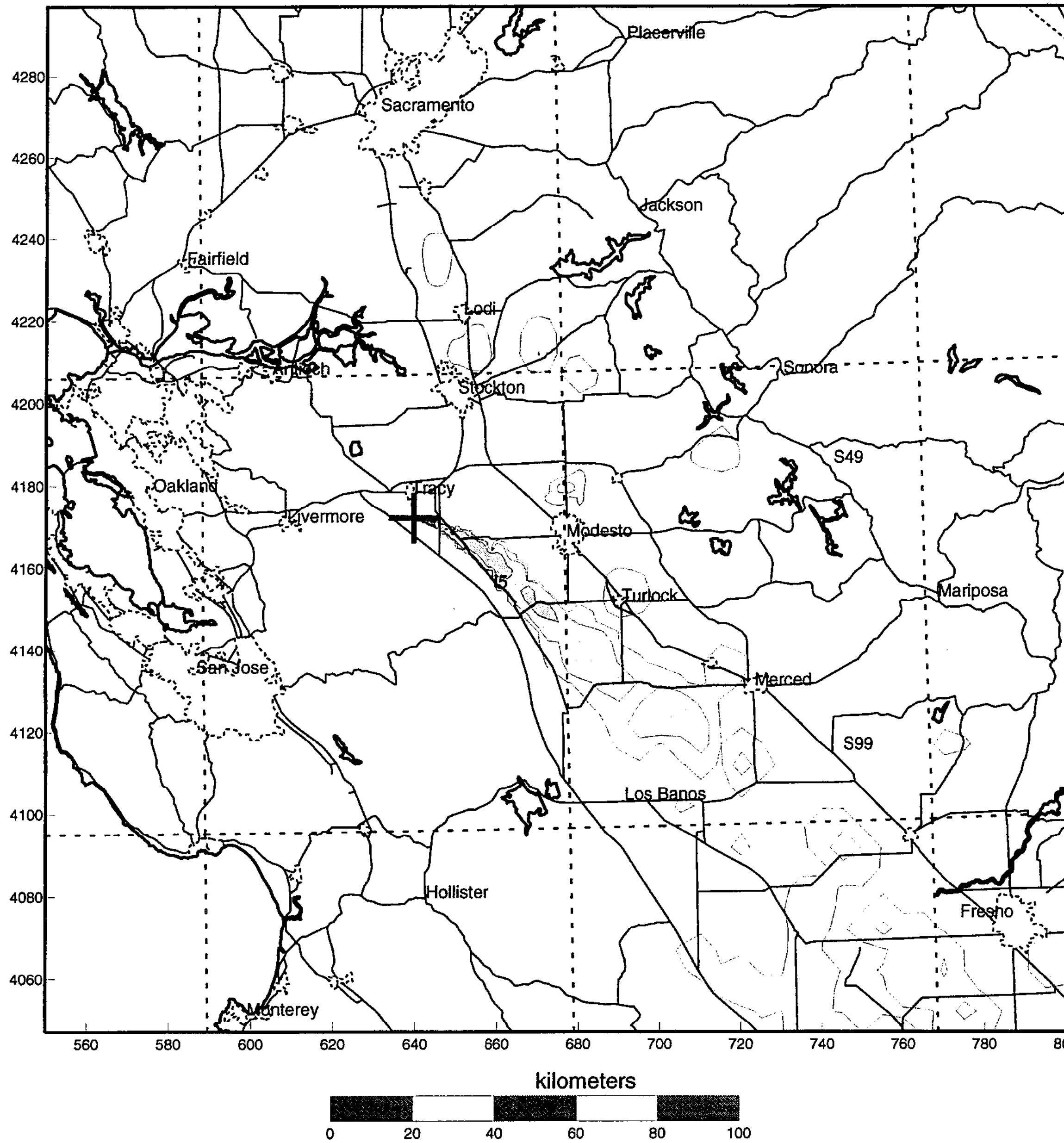
(Level and Area Covered)

>	1.00e-07 1/m3	8.03 sq km
>	1.00e-08 1/m3	72.24 sq km
>	1.00e-09 1/m3	560.71 sq km
>	1.00e-10 1/m3	1755.25 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0006

SET 3: Instantaneous Air Concentration

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
Instantaneous air at 1.5 meters
09AUG98 11:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

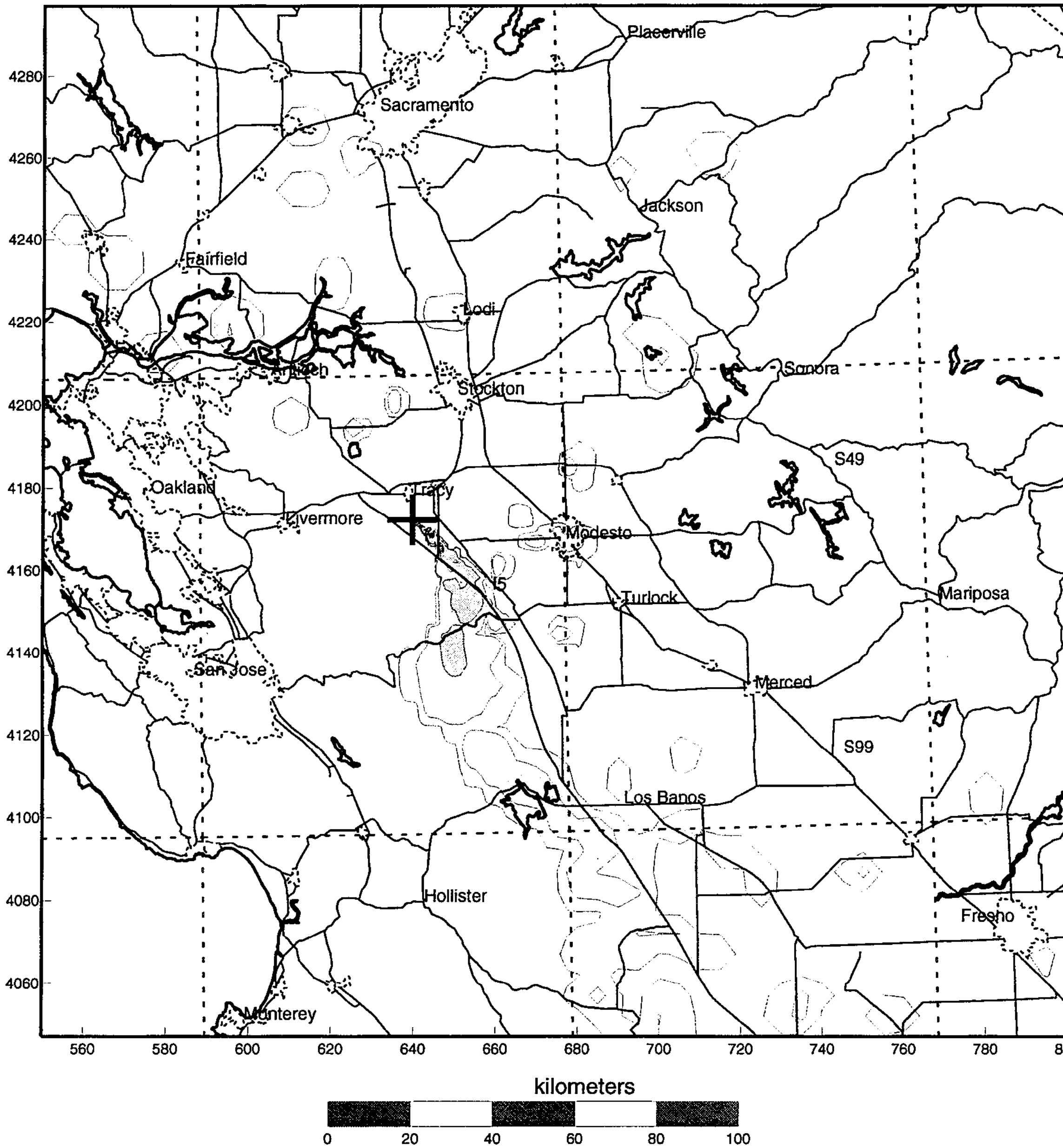
Contours:
(Level and Area Covered)

Level	Area Covered
> 1.00e-06 1/m3	0.06 sq km
> 1.00e-07 1/m3	4.91 sq km
> 1.00e-08 1/m3	97.55 sq km
> 1.00e-09 1/m3	713.06 sq km
> 1.00e-10 1/m3	3739.44 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0009

SET 3: Instantaneous Air Concentration

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
Instantaneous air at 1.5 meters
09AUG98 23:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

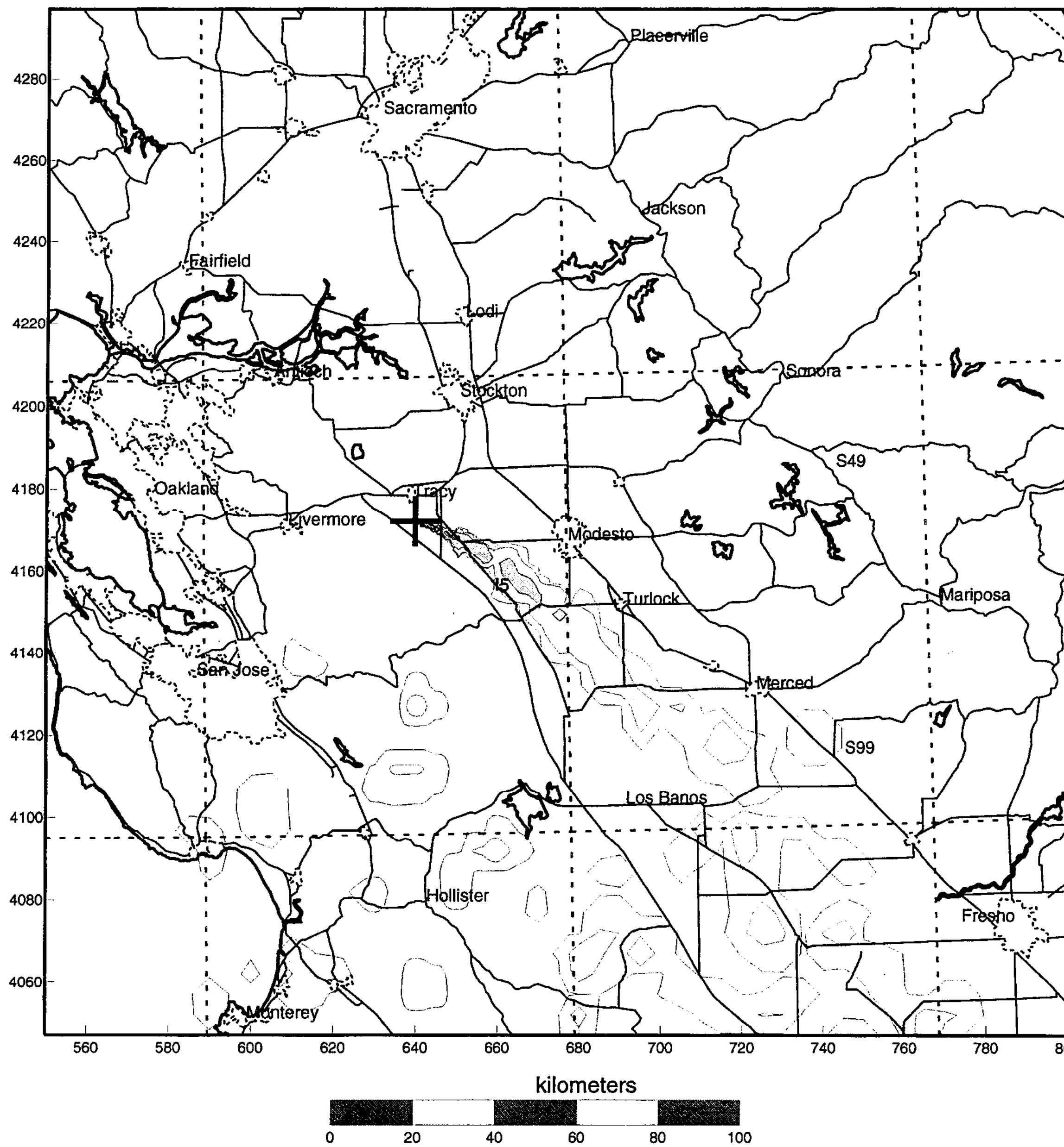
Contours:
(Level and Area Covered)

> 1.00e-07 1/m3	3.11 sq km
> 1.00e-08 1/m3	179.72 sq km
> 1.00e-09 1/m3	1271.08 sq km
> 1.00e-10 1/m3	5090.97 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0012

SET 3: Instantaneous Air Concentration

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
Instantaneous air at 1.5 meters
10AUG98 11:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

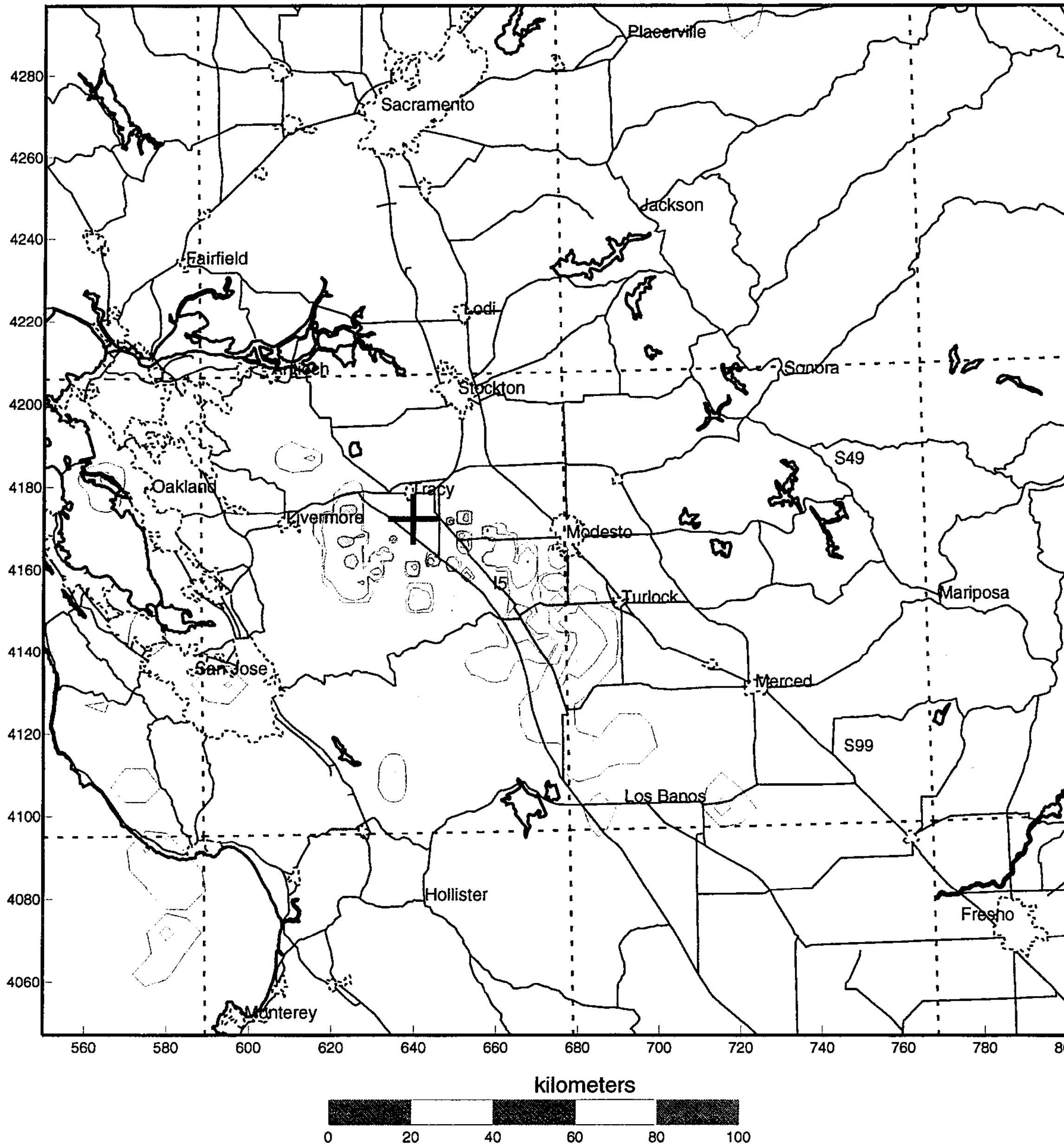
Contours:
(Level and Area Covered)

>	1.00e-06 1/m3	0.02 sq km
>	1.00e-07 1/m3	8.18 sq km
>	1.00e-08 1/m3	99.48 sq km
>	1.00e-09 1/m3	976.54 sq km
>	1.00e-10 1/m3	5403.69 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0015

SET 3: Instantaneous Air Concentration

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
Instantaneous air at 1.5 meters
10AUG98 23:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

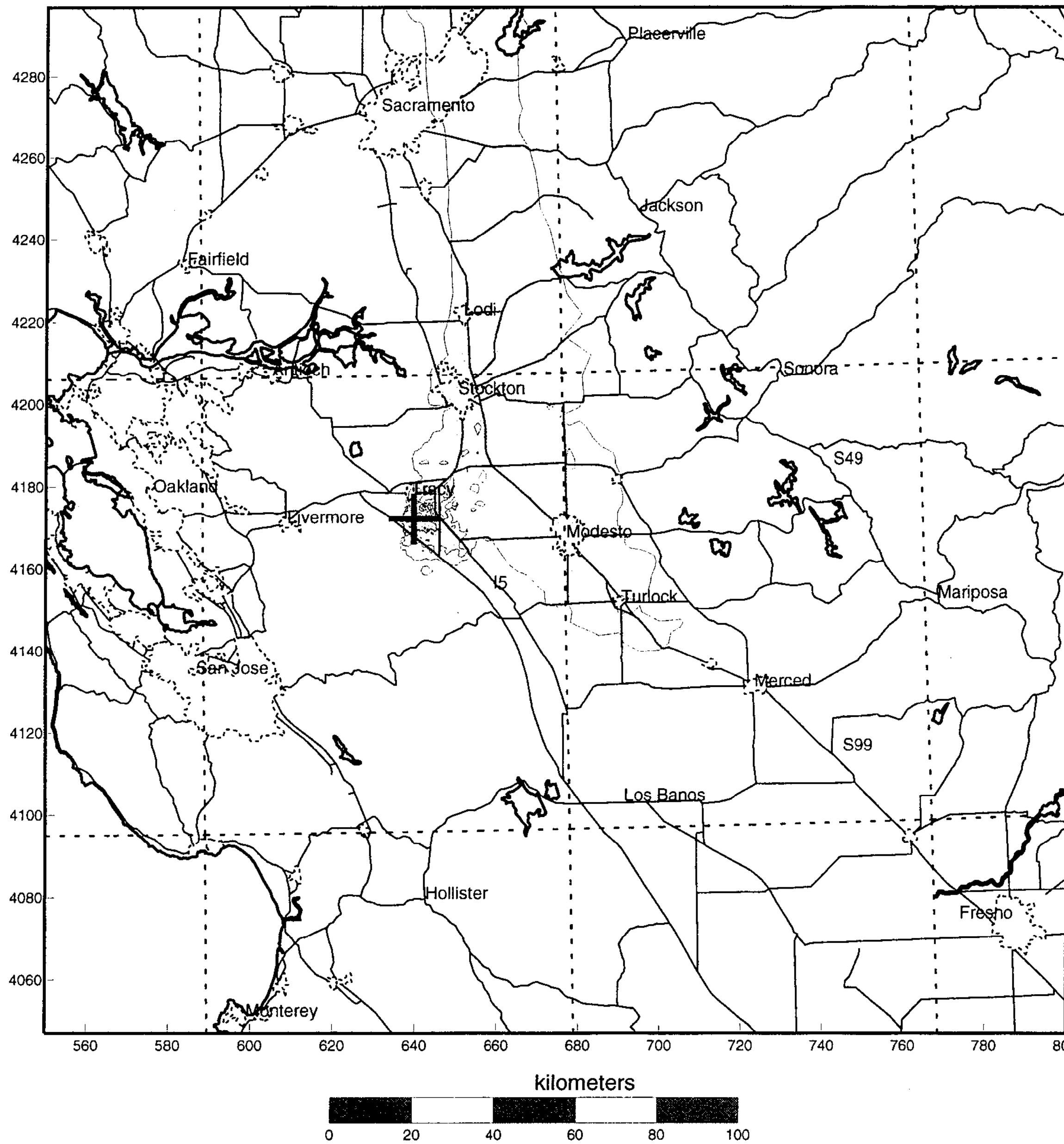
Contours:
(Level and Area Covered)

>	1.00e-08 1/m3	39.93 sq km
>	1.00e-09 1/m3	660.26 sq km
>	1.00e-10 1/m3	2677.22 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0018

SET 3: Integrated Air Concentration

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
Integrated air at 1.5 meters
07AUG98 23:30:00 to 08AUG98 23:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

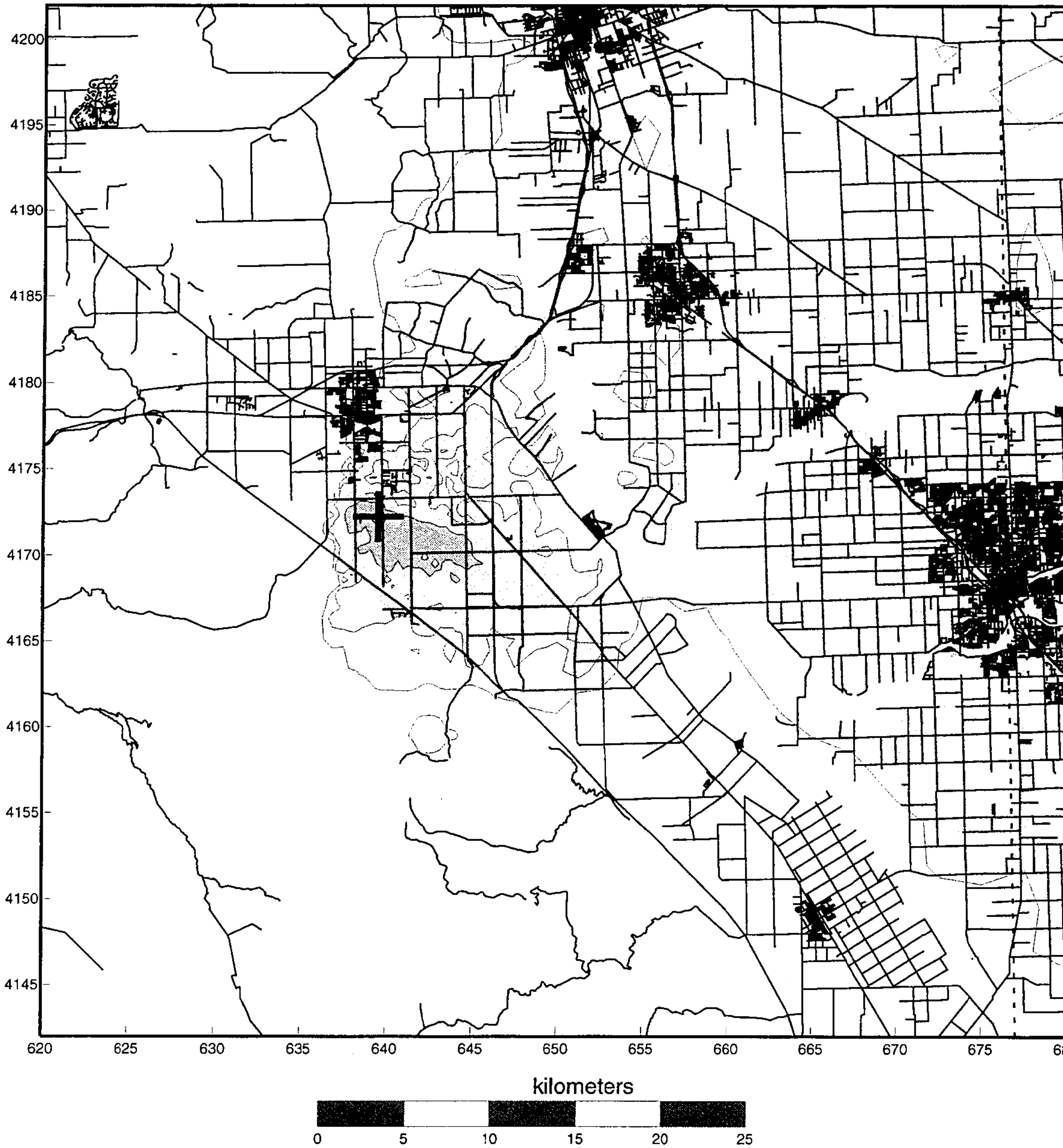
Contours:
(Level and Area Covered)

>	1.00e-02 s/m3	0.51 sq km
>	1.00e-03 s/m3	18.73 sq km
>	1.00e-04 s/m3	156.39 sq km
>	1.00e-05 s/m3	4789.87 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0005

SET 3: Integrated Air Concentration

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
Integrated air at 1.5 meters
07AUG98 23:30:00 to 08AUG98 23:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

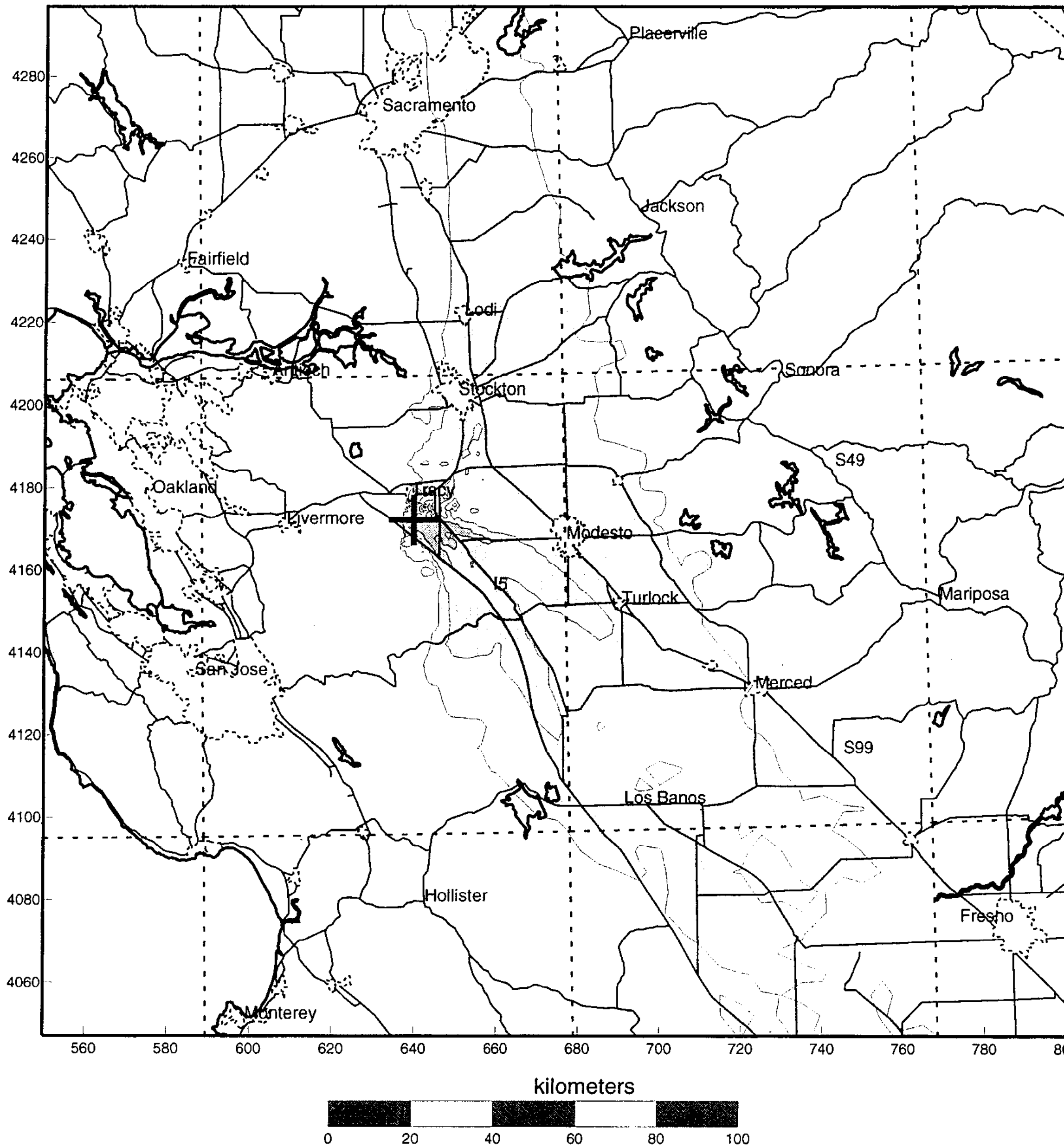
Contours:
(Level and Area Covered)

>	1.00e-02 s/m3	0.51 sq km
>	1.00e-03 s/m3	18.73 sq km
>	1.00e-04 s/m3	156.39 sq km
>	1.00e-05 s/m3	4789.87 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0005

SET 3: Integrated Air Concentration

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
Integrated air at 1.5 meters
07AUG98 23:30:00 to 09AUG98 23:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

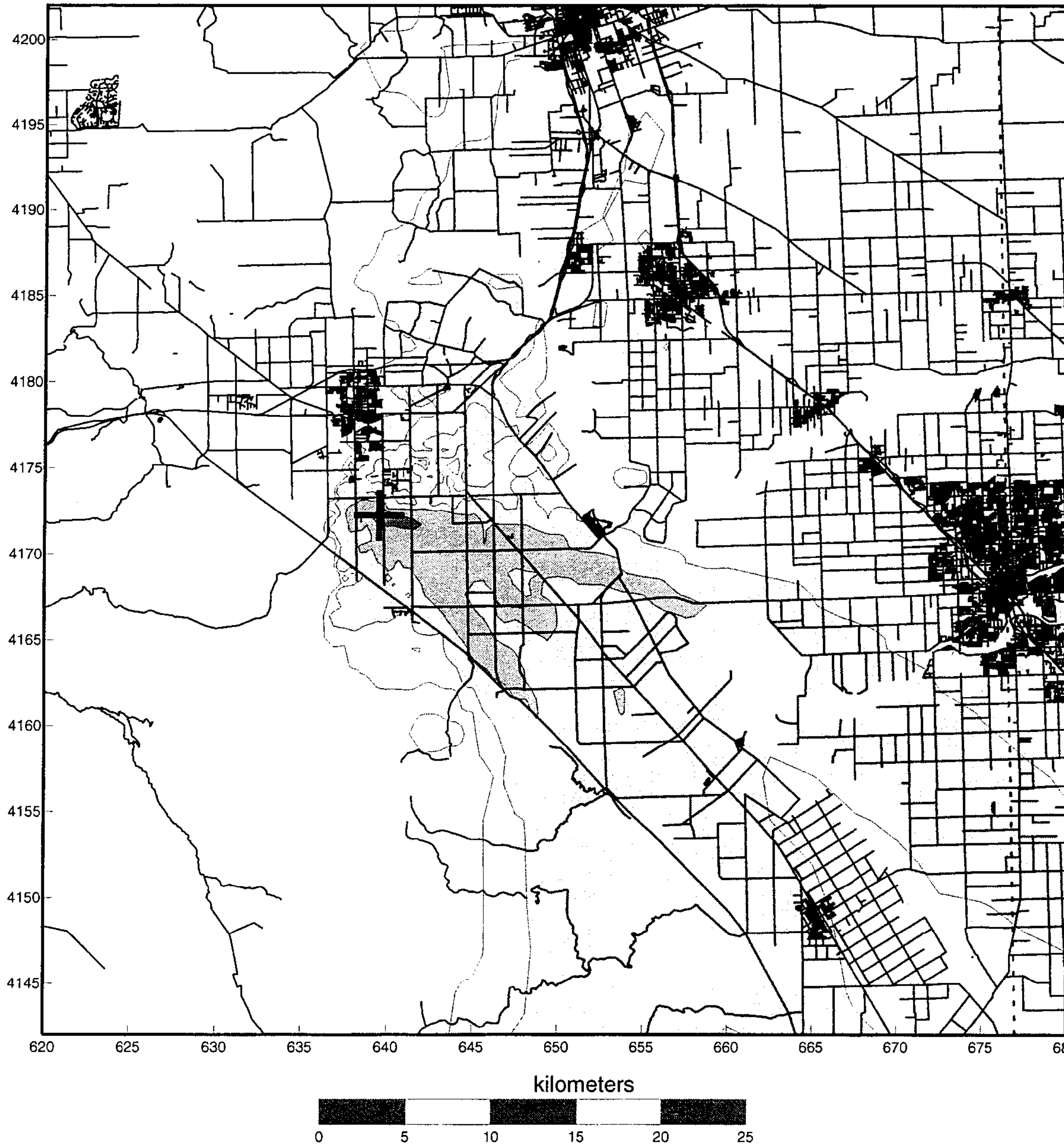
Contours:
(Level and Area Covered)

Level	Area Covered
> 1.00e-02 s/m3	1.89 sq km
> 1.00e-03 s/m3	77.34 sq km
> 1.00e-04 s/m3	1077.13 sq km
> 1.00e-05 s/m3	10998.03 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0011

SET 3: Integrated Air Concentration

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
Integrated air at 1.5 meters
07AUG98 23:30:00 to 09AUG98 23:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

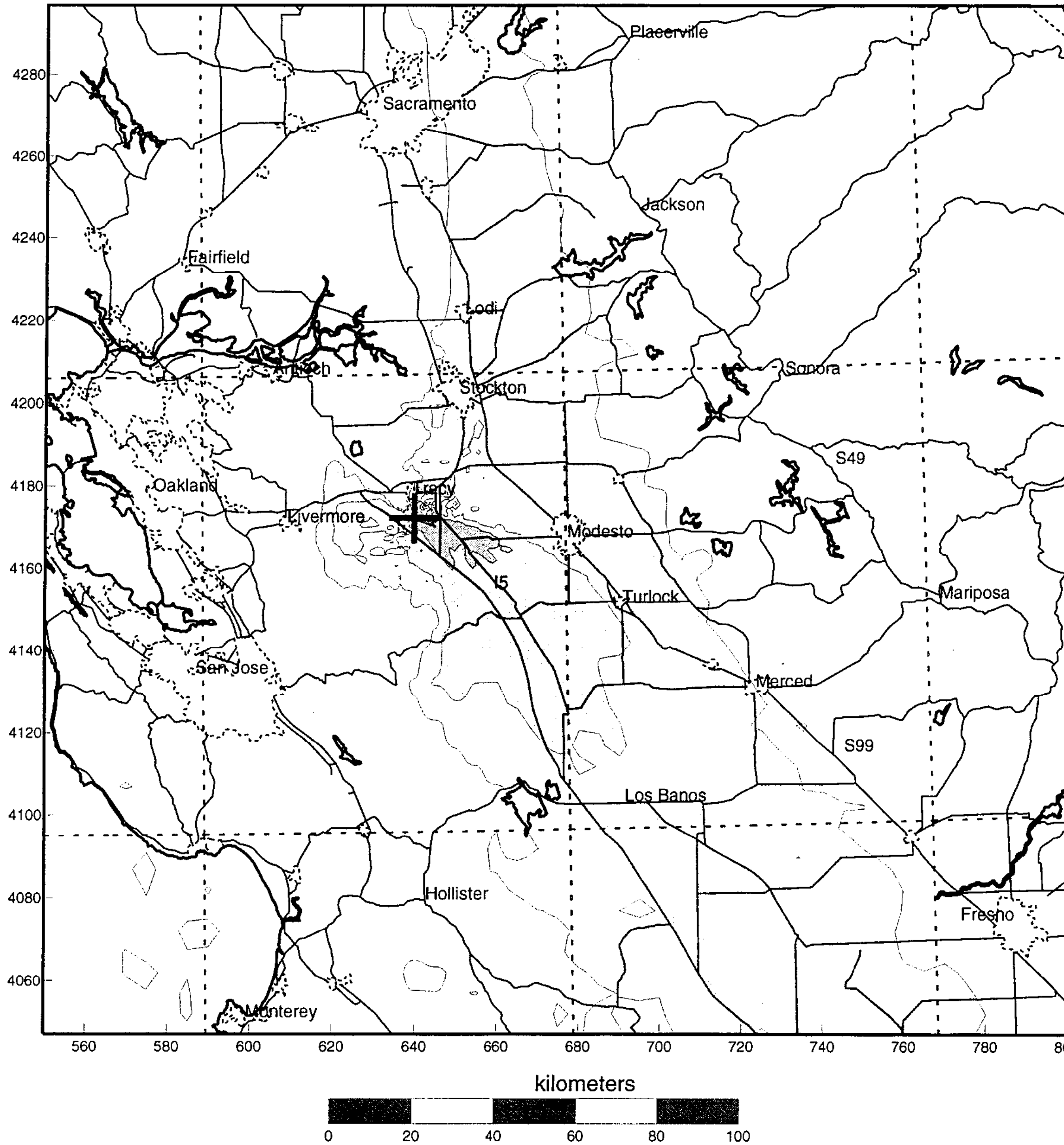
Contours:
(Level and Area Covered)

Level	Area Covered
> 1.00e-02 s/m3	1.89 sq km
> 1.00e-03 s/m3	77.34 sq km
> 1.00e-04 s/m3	1077.13 sq km
> 1.00e-05 s/m3	10998.03 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0011

SET 3: Integrated Air Concentration

Tracy Tire Fires Simulation



Plot Generation Time	27AUG98 16:45:00 UTC
Contour Type	Integrated air at 1.5 meters 07AUG98 23:30:00 to 10AUG98 23:30:00 UTC
Material	SMOKE
Source Location (longitude, latitude)	121° 25' 05" W, 37° 41' 12" N
Source Location (x, y, projection)	639.47 km E, 4172.24 km N, UTM
Remarks	Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

Contours:

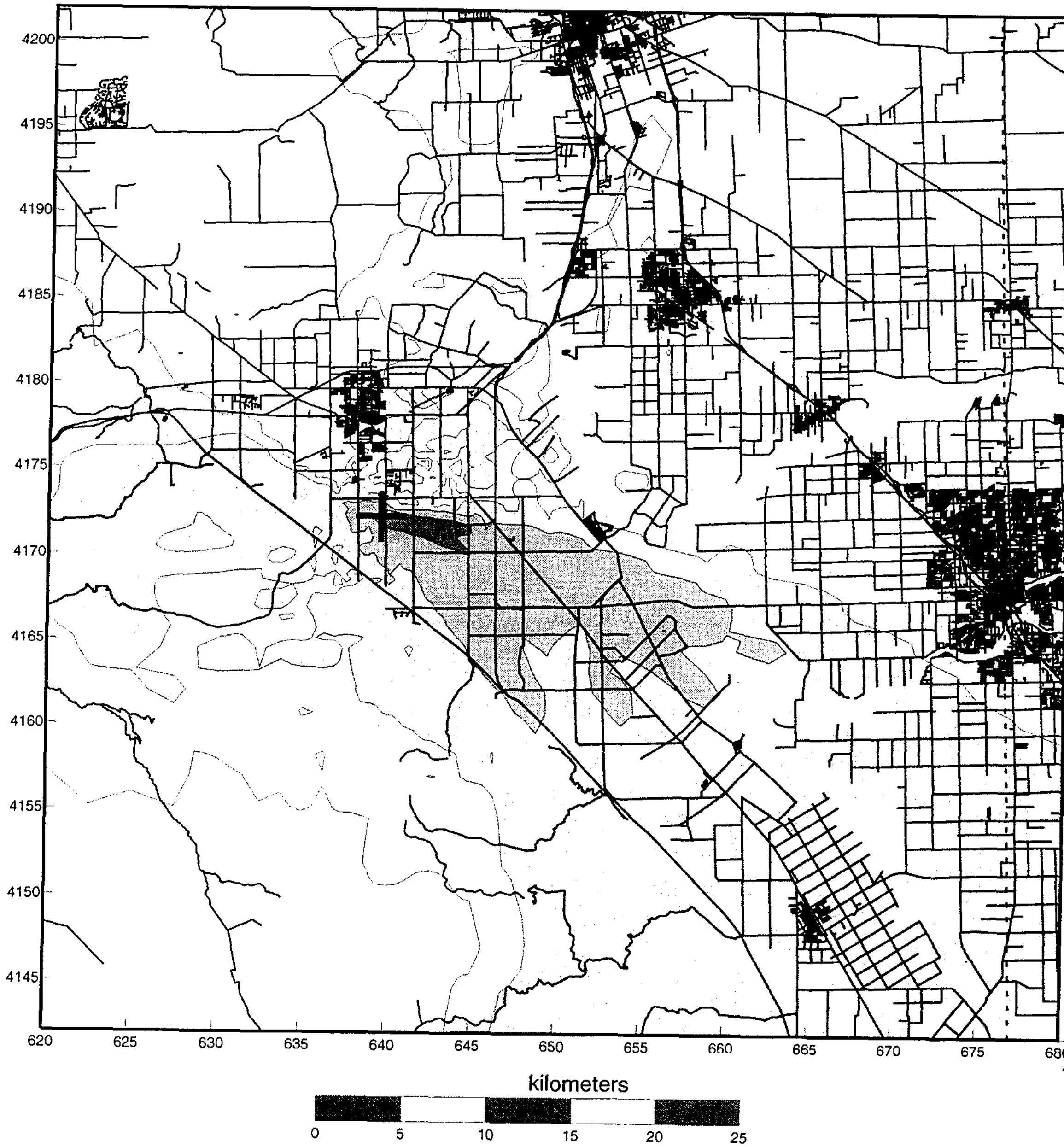
(Level and Area Covered)

Level	Area Covered
> 1.00e-01 s/m3	0.04 sq km
> 1.00e-02 s/m3	6.63 sq km
> 1.00e-03 s/m3	148.56 sq km
> 1.00e-04 s/m3	2121.33 sq km
> 1.00e-05 s/m3	15129.73 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0017

SET 3: Integrated Air Concentration

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
Integrated air at 1.5 meters
07AUG98 23:30:00 to 10AUG98 23:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

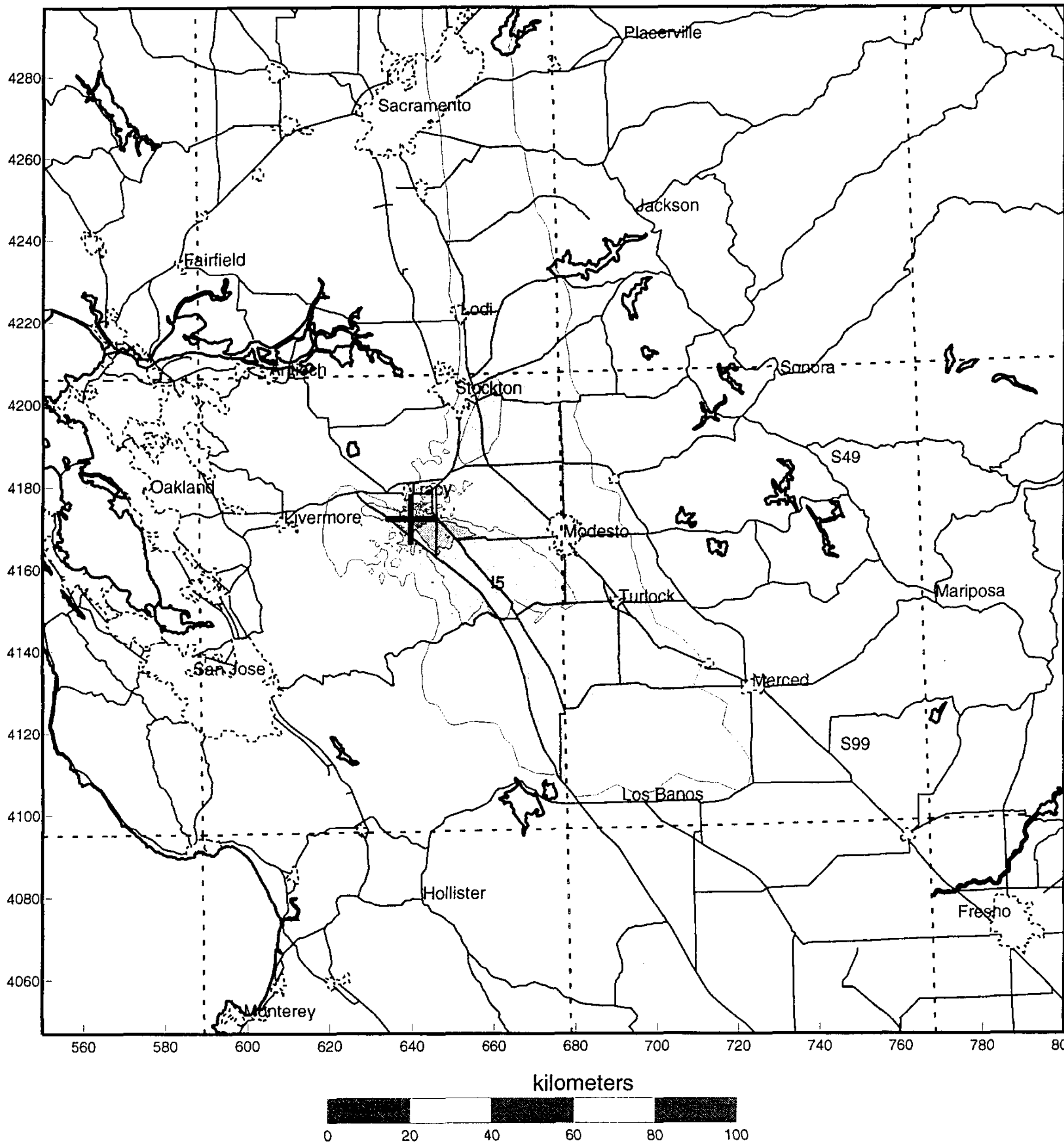
Contours:
(Level and Area Covered)

> 1.00e-01 s/m3	0.04 sq km
> 1.00e-02 s/m3	6.63 sq km
> 1.00e-03 s/m3	148.56 sq km
> 1.00e-04 s/m3	2121.33 sq km
> 1.00e-05 s/m3	15129.73 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0017

SET 3: Deposition

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
From Deposition at 0.0 meters
07AUG98 23:30:00 to 10AUG98 23:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

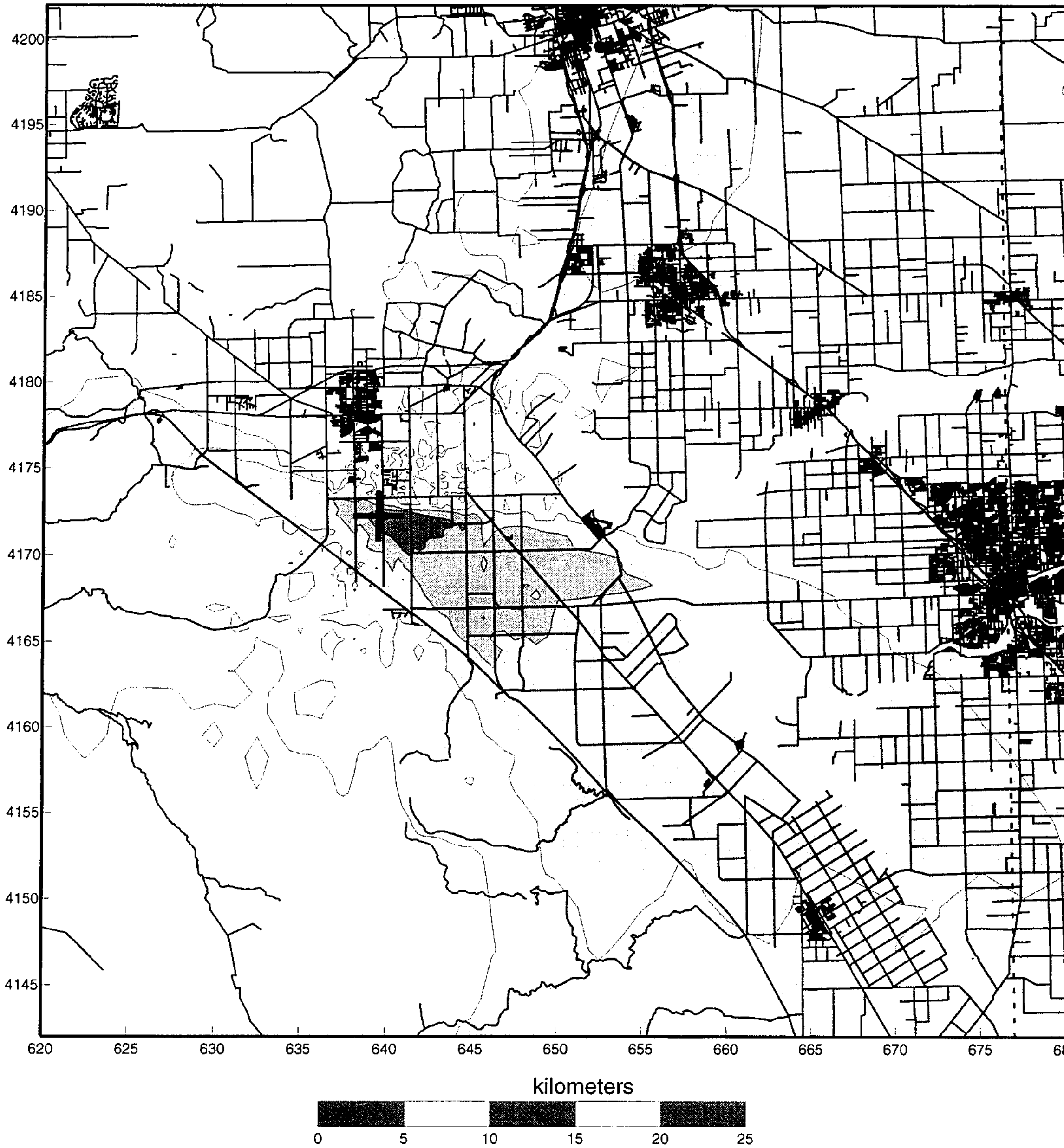
Contours:
(Level and Area Covered)

>	1.00e-02 1/m2	0.30 sq km
>	1.00e-03 1/m2	7.35 sq km
>	1.00e-04 1/m2	75.45 sq km
>	1.00e-05 1/m2	802.00 sq km
>	1.00e-06 1/m2	7594.74 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0019

SET 3: Deposition

Tracy Tire Fires Simulation



Plot Generation Time
27AUG98 16:45:00 UTC

Contour Type
From Deposition at 0.0 meters
07AUG98 23:30:00 to 10AUG98 23:30:00 UTC

Material
SMOKE

Source Location (longitude, latitude)
121° 25' 05" W, 37° 41' 12" N

Source Location (x, y, projection)
639.47 km E, 4172.24 km N, UTM

Remarks
Continuous fire source; release start at 4:30pm Aug 7; buoyant plume rise rise to 2 km hgt 1st 12 hours and then to 500 m afterward; unit src = 1/s 1st 12 hrs, 0.4/s after; met data= 6-18 hr forecast grids from latest NORAPS run

Contours:
(Level and Area Covered)

>	1.00e-02 1/m2	0.30 sq km
>	1.00e-03 1/m2	7.35 sq km
>	1.00e-04 1/m2	75.45 sq km
>	1.00e-05 1/m2	802.00 sq km
>	1.00e-06 1/m2	7594.74 sq km

ARAC ID: TIRES/27AUG_RERUN 27AUG98_0019