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POINT WARNING CLIMATOLOGY OF MT. LAGUNA, CALIFORNIA, (U)
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UNITED STATES AIR FORCE
AIR WEATHER SERVICE (MAC)

USAF ENVIRONMENTAL
TECHNICAL APPLICATIONS CENTER

SCOTT AIR FORCE BASE, ILLINOIS 62225



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POINT WARNING CLIMATOLOGY OF MT. LAGUNA, CALIFORNIA

by

James R. Clark, Capt, USAF

January 1978

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James R. Clark

JAMES R. CLARK
Capt, USAF

Calvin C. Naegelin

CALVIN C. NAEGELIN
Capt, USAF
Reviewing Officer

FOR THE COMMANDER

Walter S. Burgmann

WALTER S. BURGMANN
Scientific & Technical Information
Officer (STINFO)

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Precipitation	Chubascos																			
Temperature	Tropical Storms																			
Wind	Weather Warnings																			
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A 17-year period of record was analyzed for weather warning criteria. The four major storm types that affect southern California are discussed. Climatological values of temperature, precipitation, and wind are presented monthly for individual warning elements.																				

P R E F A C E

The USAF Environmental Technical Applications Center (USAFETAC) prepared this report to answer a request from Detachment 11, 12th Weather Squadron, Luke AFB, AZ. They requested climatological data to assist in issuing point weather warnings for a radar site at Mt. Laguna, California. Physical separation and geographical location make point warning forecasting for Mt. Laguna extremely difficult for the Luke AFB forecaster.

Climatological data were obtained from USAFETAC/OL-A, Asheville, NC and Mrs. Dorothy L. Haak, the National Weather Service Cooperative Observer at Mt. Laguna. As a result, a 17-year period of record was available for some point warning elements. Mrs. Haak's voluntary assistance is gratefully acknowledged.

This report answers a specific request and is not expected to have application beyond that request. Further questions on this problem or related problems should be referred to USAFETAC for consultation and study.

If the requestor or any other agency incorporates this report, in whole or in part, into another report, we request that USAFETAC be given proper credit and be furnished a copy of the new report if possible.

POINT WARNING CLIMATOLOGY OF MT. LAGUNA, CALIFORNIA

Introduction

Mt. Laguna, California, is located approximately 45 miles east of San Diego and along the eastern edge of the Peninsula Mountain Range (see Figures 1a and 1b). In contrast to the Transverse Range, the eastern flank of the Peninsula Range plunges to the low desert floor. The Peninsula Range runs parallel to the coast and continues down into Mexico. Elevation of Mt. Laguna is approximately 6000 feet.

Storm Types Affecting Southern California

Blake (1933) and Reed (1932) categorized the weather patterns affecting southern California into four broad types. The North Pacific type includes all low-pressure systems that approach the mainland from the Pacific Ocean north of San Francisco. These northern storm tracks move southward with the approach of winter, affecting southern California from November to May. Of the four weather patterns, this type is the most prevalent and is responsible for the majority of winter precipitation. However, large excesses and deficiencies in seasonal precipitation totals are more likely due to an unusual number of storms of the other types than to variations in the North Pacific type.

The second weather pattern, designated as the South Pacific type, includes all disturbances that come from the Pacific Ocean south of San Francisco and north of the Tropic of Cancer. The majority of South Pacific storms form during November through March with a maximum in February. The storms may develop in several ways. They sometimes develop along the southern California coast on the tropical side of an eastern Pacific high pressure ridge, or they may move along the coast after passing around the ridge's eastern flank. The majority of the South Pacific type lows form in this second manner. Occasionally, secondary depressions may form in the lower end of a trough that lies near the southern California coast and move basically in the same direction as the other two major systems in this type. Precipitation amounts for the South Pacific storm type vary widely.

The third weather pattern, designated the interior type, consists of all active depressions that originate or develop over the plateau regions, the Colorado Valley, or the California interior. These complicated disturbances form primarily in the Great Basin, but may originate anywhere over the far western interior. Their growth and movement is erratic and hard to predict. The interior storms are most active from February to May, but they may form any month of the year.

The fourth weather pattern, designated the Mexican type, consists of two distinct phenomena: the tropical disturbances that occasionally move northward to southern California from the west coast of Mexico from August to November, and the few sporadic thunderstorms that develop in the mountains and deserts of lower and southern California from the middle of June to the middle of September. These sporadic thunderstorms are locally known as "Sonoras." The Mexican type is responsible for the smallest number of southern California storms, but may produce the most locally heavy precipitation. Eastern Pacific tropical cyclones, locally called "Chubascos," originate in the tropics south and west of Baja, California. They then move northward across western Mexico and southwestern California, again bringing locally heavy precipitation.

Climatology of Some Weather Warning Criteria

Precipitation. Precipitation in southern California is light except in the high mountains. According to the Climatic Summaries of the US, 1930, more than 75% of the total annual precipitation occurs during the winter months. In some areas of the mountains, excessively heavy rains may occur within short periods of time. The topography, elevation, and exposure have significant effect on the recorded precipitation amounts.

Mt. Laguna receives about 16.5 inches of precipitation annually. Approximately 20% of that precipitation occurs in December. Table 1 gives the average monthly precipitation at Mt. Laguna. The extreme values of precipitation illustrate the variability of precipitation in southern California.

Rainfall. Climatological records for Mt. Laguna from June 1943 to February 1950 indicate no rain days with rainfall greater than 2 inches per day. However, heavy

rainfall associated with strong thunderstorms or dissipating "Chubascos" may reach or exceed that amount (Fors, 1977). The "Chubascos" that approach or cross southern California produce the greatest single amounts of precipitation in the mountains. For example, thirteen inches were recorded at Mt. Wilson in September 1939 when a tropical cyclone moved inland near San Pedro. Mt. Laguna recorded 10.13 inches from Hurricane Kathleen in September 1976 (Fors, 1977) and over 4 inches from Doreen in August 1977 (Haak, 1977).

Snowfall. Snow accounts for about 50% of the precipitation received at Mt. Laguna during the winter months. Snow may occur from October through May, but the largest amounts are received in December. The annual average is about 61 inches. Days with snowfall greater than 2 inches in a 24-hour period occur most often from November through April.

Freezing Precipitation. Mt. Laguna receives freezing precipitation an average of 10 days a year. March has the largest number of days (3) with freezing precipitation. December, February, and April experience freezing precipitation an average of two days per month.

Temperature. Temperature extremes can vary greatly at Mt. Laguna (Table 1). Occasionally, January and May experience differences in the extreme maximum/minimum temperatures of over 64°F. Average maximum/minimum temperature differences vary from 16 to 23°F with the greatest deviations occurring in May.

Tropical Cyclones. In the past 60 years only five major tropical cyclones have affected California. Four of these storms caused significant precipitation in southern California. The most destructive was Kathleen in September of 1976 (Fors, 1977). Kathleen moved onshore about 190 nautical miles south of San Diego and moved northeast into the California desert region. During this period 10.13 inches of rain were recorded at Mt. Laguna, 10.78 inches at Mt. Wilson, and 14.78 inches on San Gorgonia Mountain northwest of Palm Springs. Thirteen inches of rain were recorded at Mt. Wilson in September of 1939 when a tropical cyclone moved inland near Los Angeles. That same year, two other cyclones passed less than 200 miles south of San Diego.

September is the month of the greatest frequency of Eastern North Pacific tropical cyclones and the month that most recurve into Mexico (Fors, 1977). Tropical cyclones, which follow paths that affect Mt. Laguna, usually develop in the first two weeks in September, with a maximum occurring around 10 September (Baum, 1975).

Thunderstorms. Blake (1933) associates two major synoptic patterns with most of the thunderstorms over the southern California mountains. One pattern consists of air approaching southern California from the south and east. The resulting "Sonoras" usually originate over the great deserts of lower and southern California and reach their maximum development over the mountains. The other pattern brings in moist, tropical air from dissipating tropical cyclones that move far enough north along the west coast of Mexico to affect southern California.

The Peninsula Range averages about 18 thunderstorm days per summer (Tubbs, 1972). At Mount Laguna the majority of thunderstorms occur from July through September with the maximum in August. Mt. Laguna averages ten thunderstorm days a year.

Hail is possible at Mt. Laguna during all months (Table 1); however, it is rare during the winter months. August and September have the most occurrences. Hail size varies with season but rarely exceeds one-half inch (Haak, 1977).

Tornadoes. Tornadoes are infrequent in southern California. One such occurrence near San Diego on February 23, 1971, was associated with a strong frontal system. Such rare occurrences are most often associated with thunderstorms or frontal systems. Tornadoes are not considered to be a weather warning problem at Mt. Laguna.

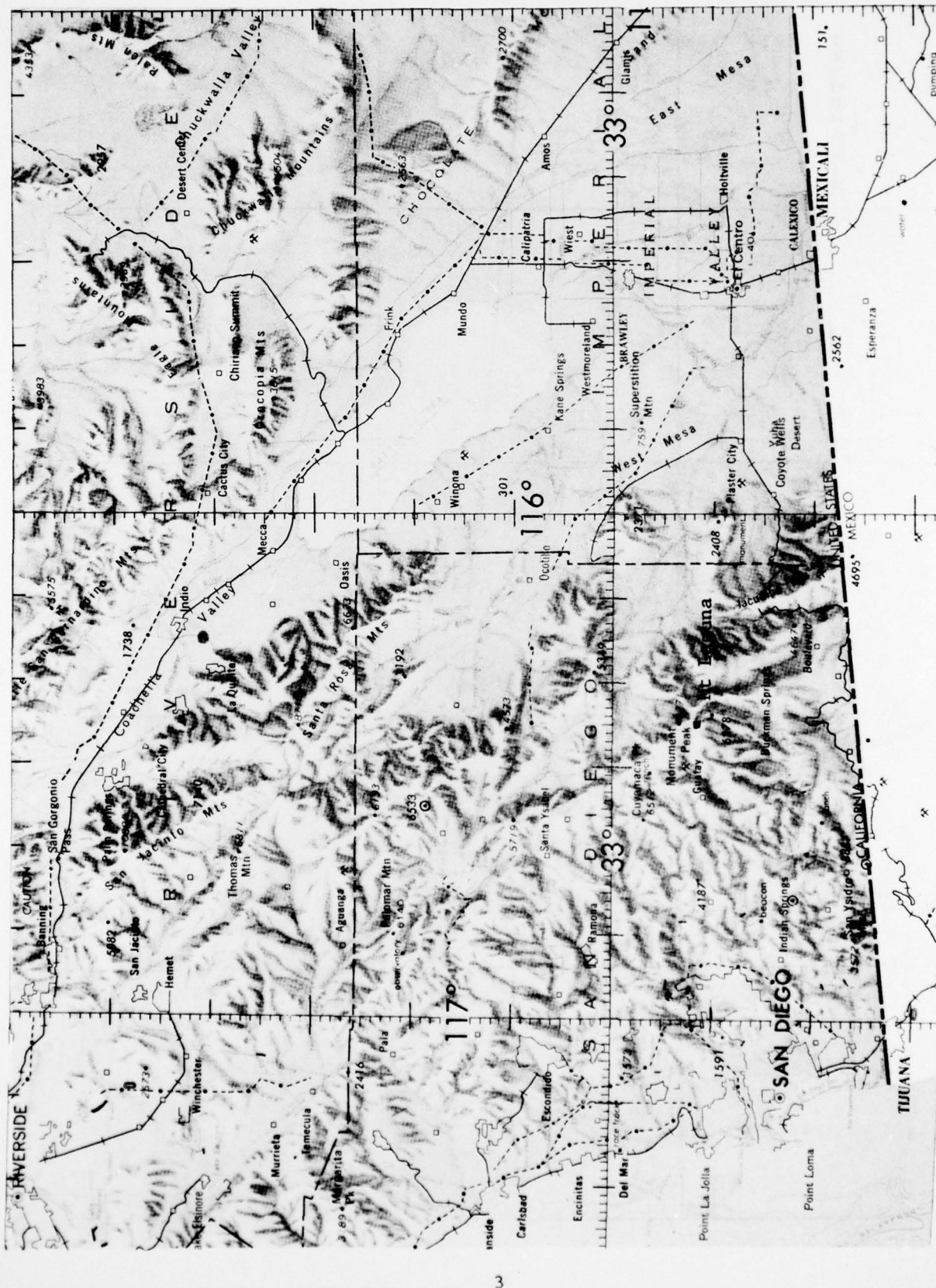
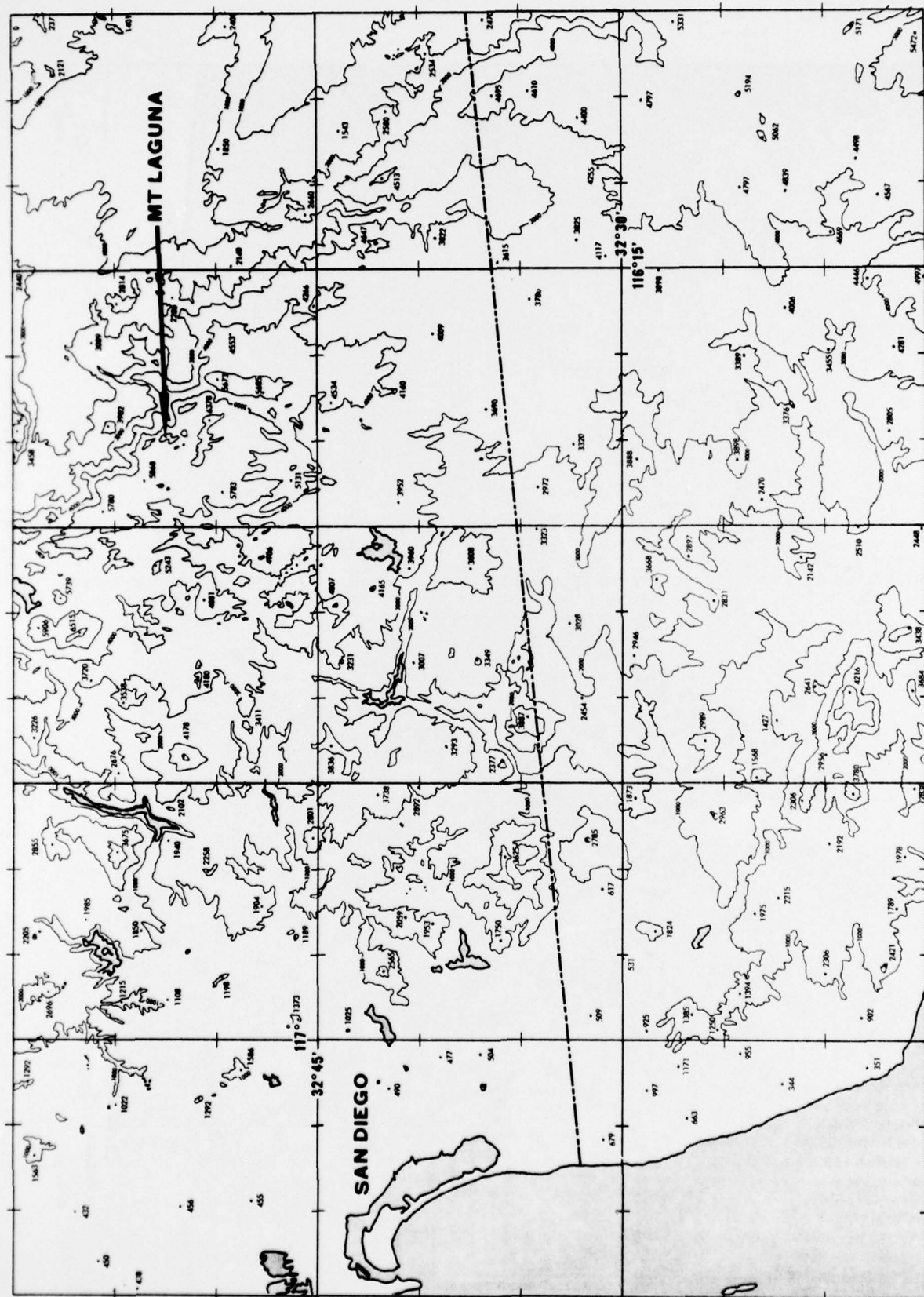


Figure 1a. Relief Map of Southwest Southern California.



1:500,000 SCALE



Figure 1b. Terrestrial Map of Mt. Laguna Area.

Table 1. Climatological Data for Mt. Laguna, California, Station Number 23178, for the Period of Record from Jun 43 to Feb 50, and Jul 66 to Sep 77.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Temperatures (°F)													
Extreme Max	73	69	72	78	90	88	97	94	90	77	76	67	-
Extreme Min	8	14	12	18	23	28	44	41	32	16	17	9	-
Average Max*	48	49	51	56	66	74	81	79	73	62	54	47	62
Average Min*	31	32	32	34	43	52	59	58	52	44	37	31	42
Precipitation (in)													
Average	1.92	1.97	2.44	0.99	0.38	0.15	0.59	1.24	1.17	0.84	1.95	3.33	16.48
Extreme Max	8.61	7.34	7.55	3.68	1.76	1.3	3.12	5.42	10.69	3.04	6.02	11.28	-
Extreme Min	0	0	0	0.09	0	0	0	0	0	0	0.22	0.32	-
Snow (in)													
Average	9.8	8.5	13.3	7.6	0.6	0	0	0	0	0.6	2.1	16.4	60.6
Extreme Max	43.5	49.0	61.5	45.8	4.0	0	0	0	0	9.0	9.8	80.5	-
Extreme Min	0	0	0	0	0	0	0	0	0	0	0	0	0
Occurrence (No. Days)													
Precip >2 (in)**	0	0	0	0	0	0	0	0	0	0	0	0	0
Freezing Precip**	2	3	#	2	#	#	0	0	0	#	1	2	10
Snow >2 (in)**	#	#	#	#	0	0	0	0	0	0	#	1	4
Thunderstorm	#	0	#	#	#	#	3	5	2	#	0	0	10
Hail	#	#	#	#	#	#	#	#	#	#	0	#	#
Wind (mph)													
Extreme**	125	100	100	95	86	114	64	62	75	78	89	93	-

*Jul 66 - Sep 77 only **June 43 - Feb 50 only # Less than one day

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