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CENTRAL SAN JOAQUIN VALLEY TYPE MAPS

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Central San Joaquin Valley Type Maps

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I. INTRODUCTION

Type maps have been used as forecast tools by many forecasters over past years. The Fruit-Frost Service in the western states has used type maps effectively for a very long period. There are various methods and procedures to identify or classify maps. This paper is about map typing aimed at a specific forecast problem--forecasting critical minimum temperatures. The various synoptic patterns that precede low minimum temperatures in the Great Valley of California have been typed. Frost or subfreezing temperatures have occurred with all of these types. Of course, the development of damaging temperatures and their duration can be estimated on some occasions without making reference to type maps by just using one or two factors (e.g., low afternoon temperatures, low dew points, cloudy or cloudless skies, etc.). However, type maps can alert one as to whether there may or may not be a damaging-temperature forecast problem when critical temperatures are not obvious. This can be important when preparing agricultural forecasts under operational deadlines.

II. TYPE MAP CLASSIFICATION

Essentially the same type-map classifications are used when preparing forecasts for Tulare, Kern, and Fresno counties (Figure 1). Basic types for the Great Valley of California were originally discussed in Charles C. Allen's paper, "Forecasting Notes on the Central California Citrus District", (about 1954). The subtypes currently in use and described here were added to these basic types by the author.

The classification system is based on using the major upper-air feature; i.e., a ridge or a trough, and its geographical position. Following these first two identifications, the surface map and the lower level windflow determine the final classification. Sea-level isobars over the state of California and its environs are used to describe the surface map. The 700-mb streamline pattern is used to define the lower level wind-flow.

A ridge dominating the west coast is known as Type 1; a trough dominating the same area is classified as Type 2. There are four different surface-map and winds-aloft features used to separate synoptic patterns within the Type 1 classification. Type 1 is usually a stagnant or slow moving weather pattern associated with fog or low clouds for several days or a long string of cold clear "radiational" nights.

Type 2, a trough doiminating the west coast, is associated with the majority of cold nights experienced in the central valley. A cold night is defined here as one where the temperature is 32° or lower somewhere in the area. There are three different trough patterns used to separate maps in this type. The first has the trough line just west of the Sierra Nevada; the second has the trough line east of the Sierra Nevada; and the third involves closed lows. Within this third subclassification, the position of the low center itself creates a further separation

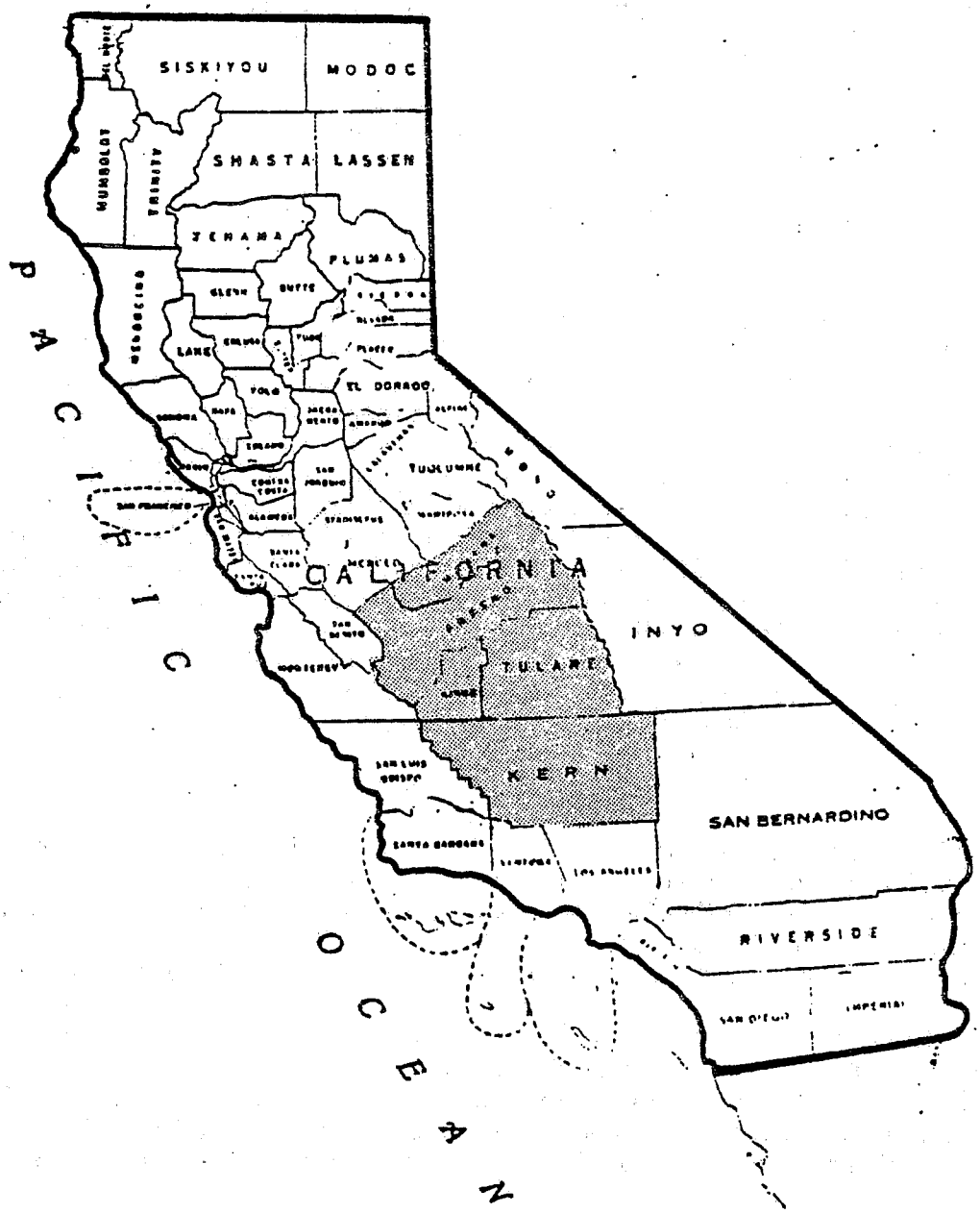

SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
GLENN
BUTTE
MENDOCINO
LAKE
YOLO
EL DORADO
NEVADA
TUOLUMNE
CALIFORNIA
INYO
TULARE
KERN
SAN BERNARDINO
RIVERSIDE
IMPERIAL
PACIFIC
OCEAN

Figure 1

for typing. In the first instance the low center is over the Colorado River. In the second the center is off the west coast. In the third the low center is again over the Colorado River, but the upper wind flow over the Great Valley is from the northwest as opposed to southeast in the first instance.

The minimum-temperature forecast problem is most difficult when the arrival of a new air mass behind a frontal system is involved. This is taken into account in the basic classification by appending an "f" to the type map classification to identify the involvement of a frontal passage and/or an air-mass change. Preparing minimum-temperature forecasts during these regimes is obviously more difficult since it involves evaluating the air-mass temperature change in addition to radiational considerations.

III. CLASSIFYING CRITERIA

Type 1 - Ridge over the Pacific coast states

A. Crest overhead

1. NW-SE isobars, with NW winds aloft
2. California trough*, with NE winds aloft
3. California trough*, with W to N winds aloft
4. NE-SW isobars

Type 2 - Trough over the Pacific coast states

A. Trough overhead

1. NW-SE isobars, with NW winds aloft
2. NW-SE isobars, with S-SW winds aloft
3. California trough

B. Trough east of Sierras

1. NW-SE isobars, with W to N winds aloft
2. NE-SW isobars, with N-NE winds aloft
3. California trough, with N winds aloft

C. Closed low (over the Pacific southwest)

1. Center over the Colorado River, SW winds aloft
2. Center off the coast, SW winds aloft
3. Center over the Colorado River, NW winds aloft

Example of these map types are given in Figures 2 through 14. They are used with both forecast and observed flow patterns. Accompanying each type map is:

1. A verbal description of weather, wind-flow, and expected temperatures.
2. The range of dew points usually experienced.

*Lower pressure over the interior sections of the state at surface with higher pressure over the eastern Pacific Ocean and the Nevada Plateau.

3. The applicable range of dry bulb temperatures at 1640 PST.
4. The minimum temperature forecast for the next 18 hours by use of this formula :

$$Tn = D - \frac{H-30}{4} + V + V'$$

where: D = 1600 PST dew point in F
H = 1600 PST humidity in %
V = Variable dependent on D
V' = Variable dependent on H

5. The range of station-pressure gradient between Sacramento and Las Vegas at 1600 PST (SAC-LAS). A value of plus 4 is more-or-less normal. Large positive values usually indicate a low probability of frost since they are associated with strong northwesterly winds. Near zero and negative values indicate downslope southeasterly winds (usually involving subsidence and dynamic warming), and a low frost danger.

IV. EXAMPLES

Data for two or three specific, but typical situations, are included with each type map to give the reader a better feel for the potential usefulness of given type maps. Observed late afternoon and evening data given are:

Dry bulb temperatures at 1640 and 1900 PST
Wet bulb temperatures at 1640 and 1900 PST
Max temperature that afternoon
Dew-point temperature (DP) at 1640 and 1900 PST
Relative humidity (RH) at 1640 and 1900 PST
Computed minimum temperature by formula (FORM)
Observed 1600 PST dew points at Sacramento (SAC), Fresno (FNO), Bakersfield (BFL), and Coalinga (CLG)*.
Station Pressure gradient (GRAD) between Sacramento and Las Vegas at 1600 PST.

In the extreme left-hand column of the examples is the minimum temperature that actually occurred the following morning at the stations listed (by initials) in the second column. The stations are all in Tulare County along the Sierra foothills going from north to south: OC-Orange Cove, LC-Lemon Cove, D-Dinuba, I-Ivanhoe, V-Visalia, E-Exeter, T-Tulare, L-Lindsay, P-Porterville, S-Success, TB-Terra Bella, and E-Earlimart. In essence, these temperatures indicate the range of minimum temperatures to be expected with each type.

V. COMPARISON WITH PRECIPITATION TYPE MAPS

The type maps given above were developed as a forecast tool to assist in preparing frost forecasts--mainly on clear and calm nights. The publication of the Map Type Precipitation Probabilities for the western United States, NWS WR-96, were developed to assist forecasters in preparing precipitation forecasts. The

*now closed.

relationship between the frost and precipitation type maps is given in the table below. Column one is the "precipitation" type, column two the corresponding "frost" type, and column three is the probability of precipitation at Fresno.

Winter	1	2B	7%	Summer	1	1A	0
	2	2A	9		2	2B	0
	3	2A	14		3	2A	0
	4	2C3	12		4	2A	0
	5	2C2	10		5	2B	2
	6	1A	1		6	1A	0
	7	2B1	45		7	2B	0
	8	2C2	0		8	1A	2
	9	1A	0		9	2C1	0
	10	2B	50		10	1A	0
Spring	1	2A	14	Fall	1	2B	5
	2	1A	1		2	2B	10
	3	1A	2		3	1A	2
	4	1A	4		4	2B	0
	5	2C3	21		5	1A	4
	6	2C3	4		6	2C1	8
	7	2C3	14		7	2C1	25
	8	2A	33		8	2B	25
	9	2C1	28				
	10	2A	60				

Under 500-mb ridge flow (Frost type 1A) one would not expect much precipitation. Note that this type corresponds to several "precipitation" type maps, and the percentage chance of precipitation under this type is never greater than 4%.

Much of Fresno's annual precipitaition occurs in conjunction with upper level closed lows. Under these conditions (Type 2C) precipitation probabilities range from 0 to 28. The other pattern associated with precipitation is with an upper-air trough off the west coast and/or a frontal passage of some sort. These situations are mostly type 2A and occasionally type 2B.

In the writer's opinion the two typing systems correlate well and are synoptically comparable and compatible. Note that in the summer, no matter what the type, there is always a very low chance of precipitation. Climatologically the Great California Valley is dry June through September.

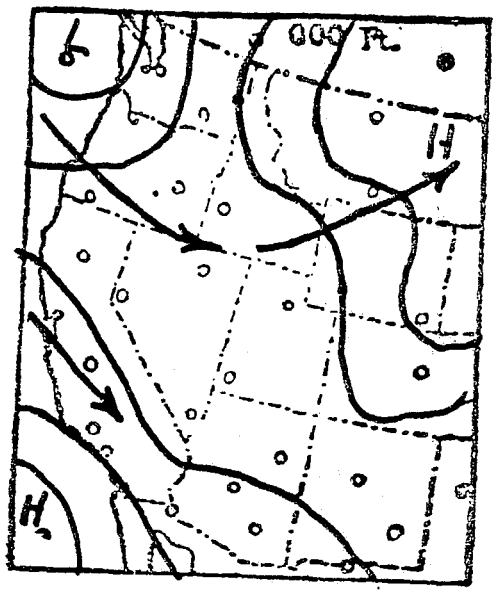
Reference:

Ellison, Eckley S., "A Critique on the Construction and Use of Minimum-Temperature Formulas", Monthly Weather Review, Volume 56, No. 12 December 1928), pp. 485-495.

Figure 2. Type 1A-1

CREST OVERHEAD	DP	31-48
NW-SE ISOBARS	1640	52-68
NW WINDS ALOFT	FORM	27-30
	GRAD	4-12

THIS TYPE OFTEN HAS CLOUDS, BUT NOT ALWAYS. NO EXTREMELY LOW TEMPERATURES OCCUR WITH THIS TYPE.

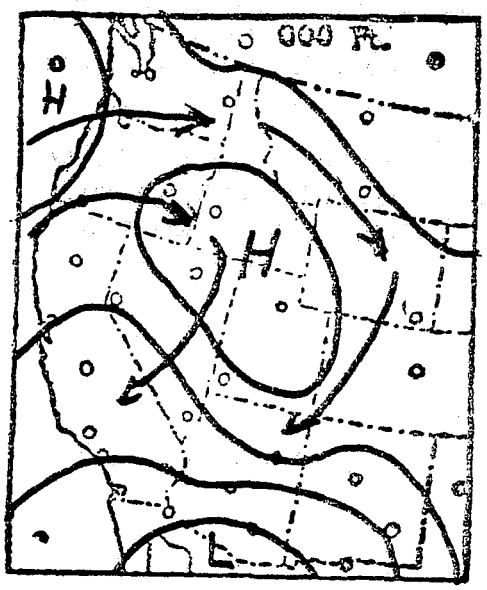


EXAMPLES:		2/19/52		3/17/53	
DRY	OC	52/38	38	61/46	35
WET	LC	44/38	37	50/44	36
MAX	D	57	37	72	34
DP	I	34/37	36	40/42	34
RH	V	50/95	38	46/88	35
	E		35		34
	T		36		31
FORM	L	27	35	32	34
SAC	P	43	35	23	35
FNO	S	33	36	37	35
BFL	TB	32	35	36	34
CLG	E	32	37	30	35
GRAD		+4.7		+10.5	

Figure 3. Type 1A-2

CREST OVERHEAD	DP	22-40
CALIF TROUGH	1640	59-70
NE WINDS ALOFT	FORM	25-32
	GRAD	<5

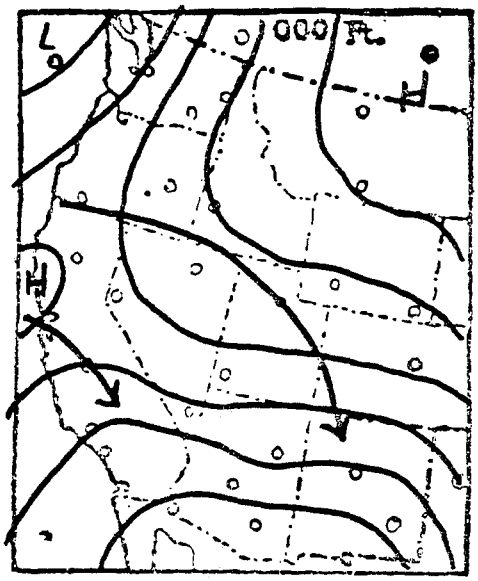
THIS IS A CLEAR SKIES VERY LITTLE WIND TYPE EVEN THOUGH THE WIND MIGHT BE EXPECTED FROM THE NE WINDS ALOFT. THE FORMULA IS RELIABLE EVEN FOR LOW RESULTS AND CAN BE COUNTED ON. THE DEW POINT AT 1900 ORDINARILY SHOULD RISE ABOUT 10 DEGREES IF THIS DOES NOT OCCUR EXPECT THE MINIMUM TO GO THROUGH THE FORMULA ABOUT 1 DEGREE.



EXAMPLES:		2/21/53		2/25/53		3/14/54	
DRY	OC	59/36	28	63/41	33	60/43	31
WET	LC	44/34	30	48/39	32	46/41	30
MAX	D	64	26	67	30	63	32
DP	I	22/32	27	32/37	31	28/38	32
RH	V	23/86	28	32/87	32	29/85	31
	E		25		30		29
	T		26		30		29
FORM	L	25	24	30	29		29
SAC	P	24	26	28	32	23	30
FNO	S	20	27	37	31	32	30
BFL	TB	16	27	33	30	30	29
CLG	E	24	25	27	32	23	30
GRAD		-1.4		+1.7		+1.7	

Figure 4. Type IA-3

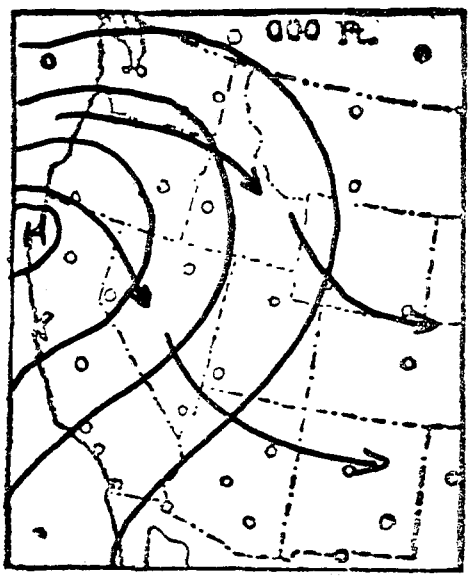
CREST OVERHEAD	DP 38-45	THIS IS A HIGH DEW POINT AND FORMULA TYPE AND CLEAR AND CALM CAN BE EXPECTED. FORMULA IS MOST RELIABLE (AS IT IS USUALLY SO HIGH) EXCEPT FOR A 1900 DEW POINT DROP. EVEN SO THE MINIMUMS WILL WILL NOT GO BELOW 30 DEGREES.
CALIF TROUGH	1640 55-63	
W-N WINDS ALOFT	FORM 32	
	GRAD NEAR 0	



EXAMPLES:		2/19/54		3/11/51	
DRY	OC	54/40	34	63/43	37
WET	LC	49/39	31	51/42	35
MAX	D	59	32	67	32
DP	I	43/39	34	38/41	34
RH	V	65/96	34	41/92	33
	E		30		32
	T		30		32
FORM	L	32	31	31	32
SAC	P	34	31	MM	34
FNO	S	36	33	MM	32
BFL	TB	37	32	MM	34
CLG	E	36	33	22	34
GRAD		+2.4		-0.4	

Figure 5. Type IA-4

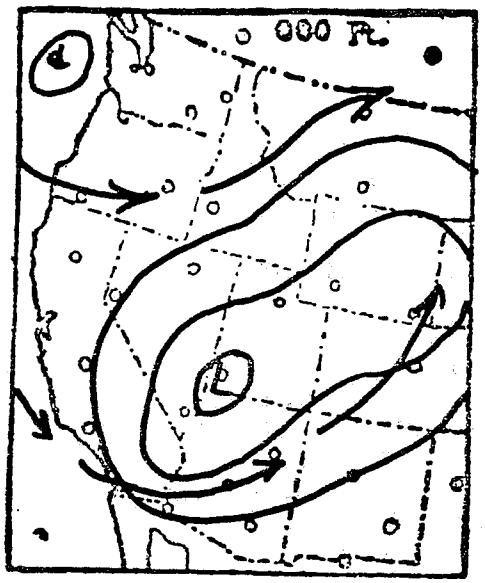
CREST OVERHEAD	DP 36	COUNT ON CLEAR SKIES DURING THE NIGHT AND LITTLE WIND. UNUSUALLY CALM WITH GRAD LESS THE 2. WHEN ANTICIPATING CALM CONDITIONS EXPECT MINIMUMS TO GO THROUGH THE FORMULA WITH LC, S, T, AND E GOING BELOW THE L MINIMUM.
NE-SW ISOBARS	1640 52-55	
	FORM 28-29	
	GRAD 0-10	



EXAMPLES:		2/19/51		2/18/54	
DRY	OC	56/28	30	52/48	33
WET	LC	47/38	29	45/45	30
MAX	D	61	29	57	31
DP	I	37/37	30	37/42	32
RH	V	49/46	33	57/83	32
	E		28		30
	T		29		30
FORM	L	29	28	29	31
SAC	P	MM	30	32	30
FNO	S	36	31	37	30
BFL	TB	27	29	35	32
CLG	E	28	28	24	32
GRAD		+1.3		+10.1	

Figure 6. Type 2A-1

TROUGH OVERHEAD	DP	24-41
NW-SE ISOBARS	1640	46-61
NW WINDS ALOFT	FORM	22-32
	GRAD	4-16
	(MOST >10)	

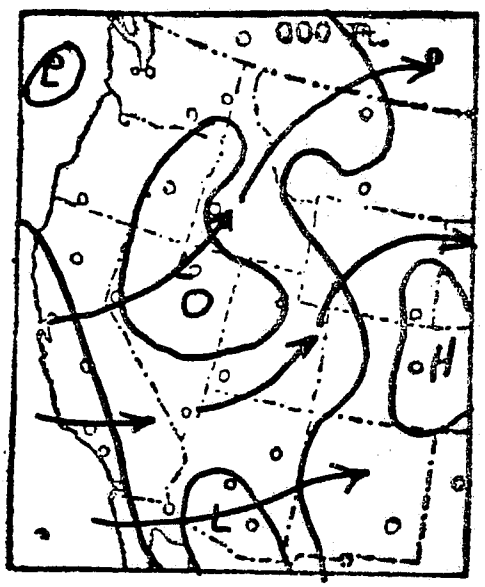


USUALLY A WINDY TYPE WITH CLEAR SKIES. SOME REALLY GET COLD. CONSIDER THE FORMULA RELIABE WITH 2-3 DEGREES ADDED ON WINDY NIGHTS. AFTER A FRONTAL PASSAGE EXPECT THE FORMULA TO BE TOO HIGH. IN GENERAL THE LOWER DP AND FORM ARE THE COLDER ONES, BUT CLOUDS ARE NOT TO BE COUNTED OUT. THIS TYPE IS FULL OF 'TRICKY' ONES- BE CAREFUL.

EXAMPLES:		4/8/53		2/17/52		3/10/54	
DRY	OC	57/43	29	49/41	29	51/46	31
WET	LC	44/38	28	43/39	28	46/43	30
MAX	D	63	28	60	MM	61	33
DP	I	24/32	30	37/37	28	42/40	32
RH	V	28/65	29	62/86	MM	70/77	31
	E		29		27	30	31
	T		28		27	29	33
FORM	L	25	29	28	26	30	31
SAC	P	29	26	24	28	34	30
FNO	S	23	26	27	27	37	31
BFL	TB	23	27	42	28	46	32
CLG	E	30	32	38	29	32	32
GRAD		+9.1		+12.2		+16.6	

Figure 7. Type 2A-2

TROUGH OVERHEAD	DP	30-38
NW-SE ISOBARS	1640	52-70
S-SW WINDS ALOFT	FORM	28-33
	GRAD	2 OR 9
	(NO IN-BETWEEN)	



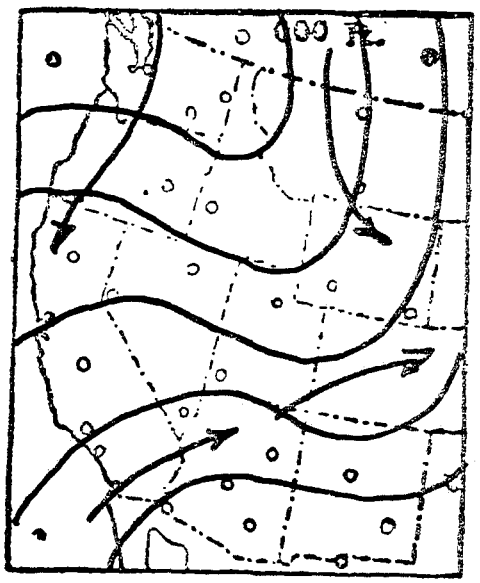
USUALLY CLEAR SKIES WITH THIS TYPE AND THE FORMULA IS QUITE RELIABLE EXCEPT IN THE 1900 DP DROP IF THE 1900 TMP IS >45 THE LOWEST MIN WILL BE 31 UNLESS THERE IS A DP DROP- THEN 30. WITH THE 1900 TMP <45 THE MIN WILL GO AS LOW AS 28. WATCH FOR TULARE TO GO BELOW THE LINDSAY KEY STATION MINIMUM. THE RULE APPLIES ASSUMING NO FRONTAL PASSAGE.

EXAMPLES:		2/20/51		2/21/51		3/13/53	
DRY	OC	61/40	32	52/47	29	65/45	36
WET	LC	48/39	29	48/43	30	51/44	35
MAX	D	66	33	63	31	69	37
DP	I	33/38	32	41/39	30	37/42	35
RH	V	35/92	32	66/73	30	35/90	34
	E		32		30		33
	T		28		29		34
FORM	L	30	31	31	30	33	33
SAC	P	46	30	40	33	33	34
FNO	S	35	30	39	34	MM	34
BFL	TB	22	33	34	31	35	34
CLG	E	30	30	36	31	33	34
GRAD		+1.7		+9.5		+1.1	

Figure 8. Type 2A-3

TROUGH OVERHEAD	DP	40-45
CALIF TROUGH	1640	55-65
	FORM	NR 32
	GRAD	2-9

THIS IS A CLEAR SKIES TYPE WITH HIGH DEW POINT AND FORMULA. THIS TYPE IS NEVER TOO COLD AND HAS YET TO HAVE A TEMPERATURE BELOW 30.

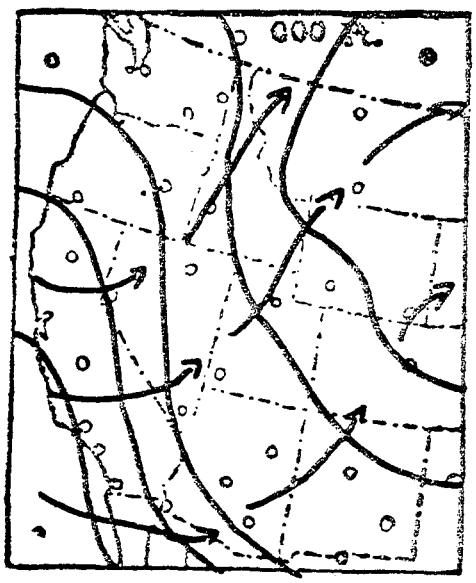


EXAMPLES:		3/4/55		3/5/55	
DRY	OC	60/44	36	60/44	36
WET	LC	51/43	35	50/42	34
MAX	D	65	33	63	35
DP	I	43/42	34	41/41	35
RH	V	54/93	32	49/92	35
	E		33		32
	T		30		34
FORM	L	32	33	31	33
SAC	P	22	34	19	36
FNO	S	40	37	40	34
BFL	TB	37	34	37	33
CLG	E	39	32	29	33
GRAD		+7.1		+2.0	

Figure 9. Type 2B-1

PLATEAU TROUGH	DP	23-44
NW-SE ISOBARS	1640	50-66
W-N WINDS ALOFT	FORM	24-33
	GRAD	5-18
	(MOST	8-12)

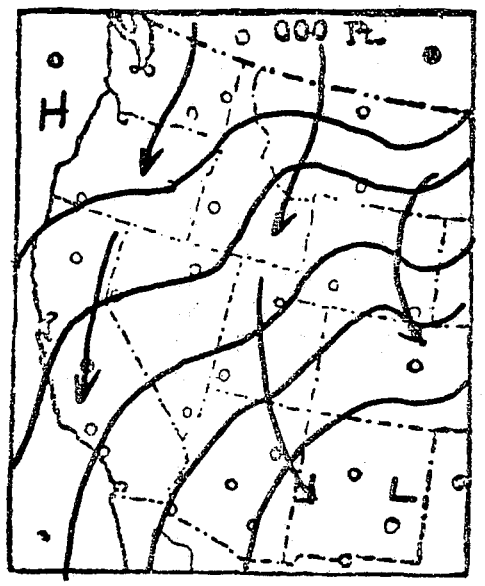
THIS TYPE INCLUDES ALL FORECAST PROBLEMS OF WIND CLOUDS AND A WIDE RANGE OF DEW POINT. DISREGARDING APRIL TYPES, A DP BELOW 30 USUALLY GIVES MINS BELOW 30. WIND CAN USUALLY BE COUNTED ON AND 3 DEGREES ADDED TO THE FORMULA WHEN IT IS BELOW 27, BUT USE CAUTION IN ADDING TO HIGHER FORMULAS. CLOUDS AND WIND WITH THIS TYPE GIVES A WIDE RANGE IN MINS THROUGHOUT THE AREA. WITH THE WINDY TYPES, BE CAREFUL OF S AND LC GOING 2-3 BELOW THE KEY STATION MINIMUM.



EXAMPLES:		3/21/53		3/11/54		4/10/53	
DRY	OC	50/34	30	50/42	31	59/50	31
WET	LC	42/34	31	41/39	28	45/41	30
MAX	D	55	30	55	34	63	34
DP	I	31/33	29	30/36	30	26/29	34
RH	V	49/45	29	46/80	30	28/44	32
	E		29		29		35
	T		29		33		31
FORM	L	24	28	24	28	26	34
SAC	P	20	28	33	28	36	32
FNO	S	27	27	29	30	32	29
BFL	TB	31	27	27	28	27	34
CLG	E	18	28	35	32	29	34
GRAD		+7.1		+11.5		+13.2	

Figure 10. Type 2B-2

PLATEAU TROUGH	DP	24-32
NE-SW ISOBARS	1640	51-60
N-NE WINDS ALOFT	FORM	23-27
	GRAD	3-10
	(MOST NR 10)	

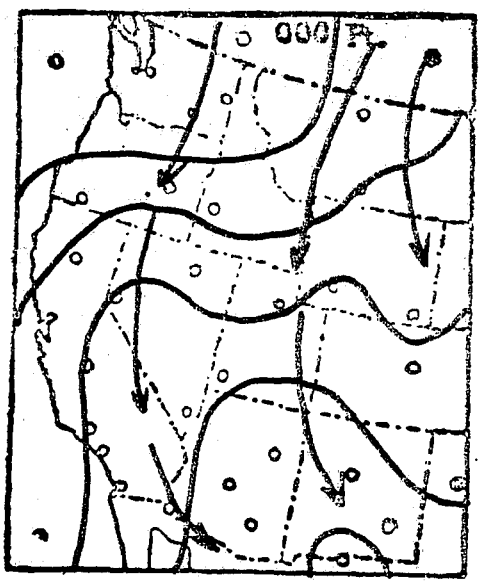


COUNT ON CLEAR SKIES AND OCCASSIONAL BREEZES. LOW VALLEY DEW POINTS ARE THE RULE AND THE FORMULA IS USUALLY 2 DEGREES LOW DEPENDING ON THE WIND. EVEN THE COLDEST HAD A FORM 2 DEGREES BELOW THE MIN. SOME STATIONS WILL GO AS LOW AS THE FORMULA EVEN THOUGH NOT AT THE KEY STATION. WITH THIS WINDY TYPE, BE CAREFUL OF S, E, T, AND LC GOING 2-3 BELOW THE KEY STATION. EXPECT THE BOTTOM TO DROP OUT WITH FRONTAL PASSAGE.

EXAMPLES:		2/19/53		2/18/53		3/20/52	
DRY	OC	51/34	29	53/36	27	54/46	31
WET	LC	40/32	30	43/36	26	44/43	30
MAX	D	56	26	55	27	57	31
DP	I	24/31	29	30/35	28	32/40	30
RH	V	35/90	28	43/94	30	43/78	34
	E		25		26		32
	T		25		24		30
FORM	L	23	26	25	28	27	31
SAC	P	15	28	20	29	30	31
FNO	S	23	25	28	25	34	29
BFL	TB	27	28	31	27	31	31
CLG	E	16	25	9	23	22	31
GRAD		+9.1		+12.5		+10.1	

Figure 11. Type 2B-3

PLATEAU TROUGH	DP	23-32
CALIF TROUGH	1640	55-60
N WINDS ALOFT	FORM	25-30
	GRAD	1-7
	(MOST NR 0)	



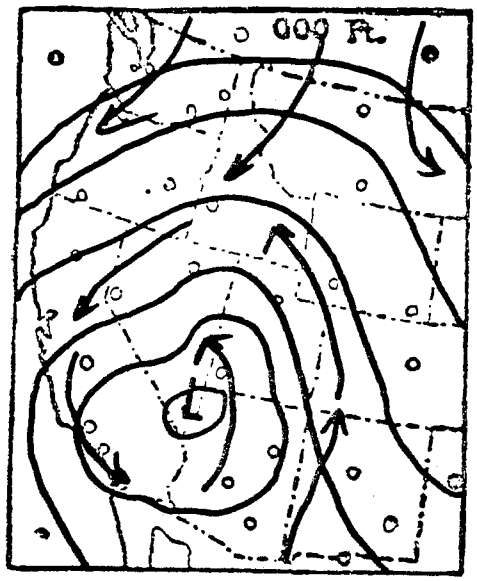
ON THIS TYPE THE DEW POINT AND FORMULA INDICATE THE WARM AND COLD ONES. DP BELOW 25 GIVES 22-28 DP 25-32 GIVES 28-32; AND DP NEAR 32 GIVES NEAR 32. WIND AND CLOUDS OCCASSIONALLY A PROBLEM. BUT USUALLY CLEAR SKIES CAN BE COUNTED ON AND THE THE FORMULA CONSIDERED RELIABLE. IN MARCH AND APRIL WHEN THE DP RISES BY 10 OR MORE- ADD 4 TO THE FORMULA FOR THE KEY STATION MINIMUM.

EXAMPLES:		2/20/53		3/3/53		3/22/52	
DRY	OC	56/36	28	58/40	31	58/40	35
WET	LC	42/33	32	47/38	30	45/39	34
MAX	D	60	24	61	30	62	35
DP	I	23/28	26	34/37	32	29/28	34
RH	V	28/73	28	40/89	32	34/93	33
	E		24		29		32
	T		24		29		31
FORM	L	25	22	30	29	26	31
SAC	P	21	25	33	30	30	33
FNO	S	22	25	28	31	33	31
BFL	TB	11	24	33	29	31	33
CLG	E	18	22	26	31	33	32
GRAD		+1.1		+1.0		+2.7	

Figure 12. Type 2C-1

CLOSED LOW	DP 37
COLORADO RIVER	1640 49
	FORM 28
	GRAD 6

LOW VALLEY DEW POINTS ARE THE RULE WITH NE WINDS ALOFT. FORMULA RELIABLE UNLESS 1900 DEW POINTS-THEN EXPECT MINIMUM BELOW THE FORMULA. WIND IS THE PROBLEM HERE RATHER THAN CLOUDS.

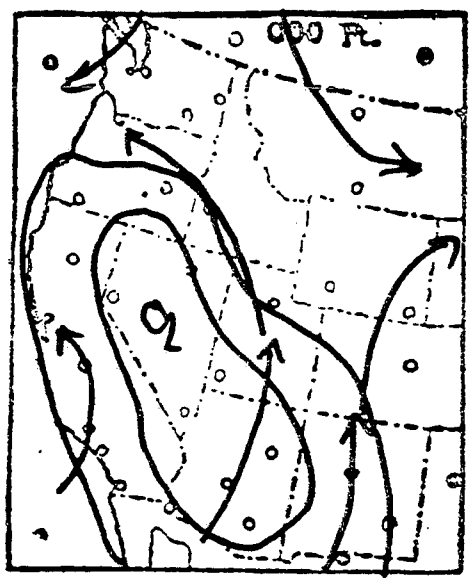


EXAMPLES:		2/23/53	
DRY	OC	48/35	28
WET	LC	43/34	27
MAX	D	55	26
DP	I	36/33	28
RH	V	63	29
	E		26
	T		26
FORM	L	28	27
SAC	P	13	27
FNO	S	37	26
BFL	TB	37	27
CLG	E	16	28
GRAD		+5.8	

Figure 13. Type 2C-2

CLOSED LOW	DP 27-47
CNTR OFF COAST	1640 45-61
	FORM 24-32
	GRAD 0-9
	(MOST 3)

INVARIABILITY THE 700 MB TEMPS ARE -8 OR LOWER. CLOUDINESS IS A CUASE FOR CONCERN CAUSING ABOVE 32 ON LOW FORMULAS. WITH CLEAR SKIES, FORMULA WILL BE CORRECT UNLESS THE DP DROPS AT 1900, THEN IT WILL BE TOO HIGH. BIG PROBLEM IS THE EFFECT OF CLOUDS, IF ANY; NOT WIND.

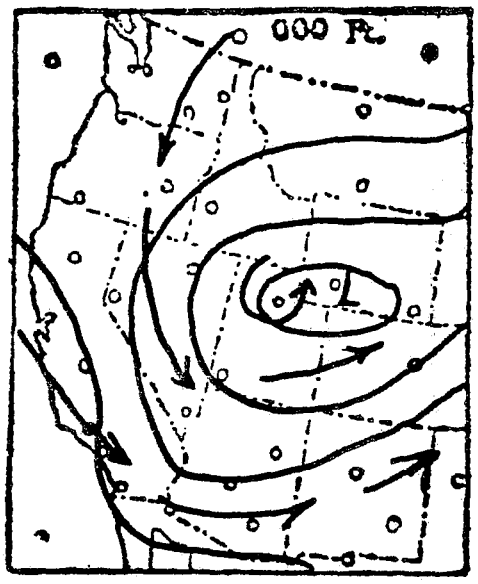


EXAMPLES:		2/23/51		3/7/52		3/16/54	
DRY	OC	47/45	30	46/36	31	41/41	38
WET	LC	45/42	30	43/36	32	41/40	39
MAX	D	62	29	51	30	62	38
DP	I	43/38	30	40/35	30	40/40	38
RH	V	87/76	30	81/97	30	78/97	38
	E		29		29		38
	T		27		30		36
FORM	L	29	28	27	28	28	36
SAC	P	35	30	MM	30	41	40
FNO	S	37	29	39	28	43	37
BFL	TB	30	29	40	29	40	37
CLG	E	41	28	37	31	40	38
GRAD		+0.0		+2.0		+3.4	

Figure 14. Type 2C-3

CLOSED LOW
COLORADO RIVER

DP 29-43
1640 46-67
FORM 22-31
GRAD 4-10



WITH A 22-26 FORMULA AND DP LESS THAN 29 THE MINIMUMS WILL RANGE 25-28. WITH FORM 27-31 AND DP >30, MINS WILL BE 29 AND HIGHER. HIGHER FORM AND DP GIVES ABOVE 32 DUE TO CLOUDS FORMED IN THE COLD AIR ALOFT. COLD AIR ALOFT DOES NOT NECESARILLY MEAN CLOUDS HOWEVER. WITH A FORM OF 22-24 EXPECT SOME STATIONS TO GO THAT LOW, BUT PERHAPS NOT THE LINDSAY KEY STATIONS.

EXAMPLES:		3/2/511		3/1/53		3/31/51	
DRY	OC	46/37	26	47/38	27	67/47	36
WET	LC	39/36	29	40/38	26	50/43	42
MAX	D	53	27	52	30	70	32
DP	I	29/35	28	30/36	29	30/39	35
RH	V	50/91	28	50/91	28	25/72	37
	E		25		28		31
	T		26		28		33
FORM	L	22	26	23	27	27	32
SAC	P	20	27	29	27	30	35
FNO	S	29	27	35	25	32	35
BFL	TB	31	27	35	27	18	32
CLG	E	24	31	28	30	24	39
GRAD		+8.8		+6.8		+4.7	

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