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A QUICK COMPARISON OF THE 1990 FREEZE WITH PAST FREEZES IN THE REDLANDS FRUIT FROST DISTRICT

Ronald S. Hamilton - WSO Riverside, California

The Riverside office has the agricultural-weather responsibility for the Redlands District. This district is located approximately 10 miles northeast of the Riverside office and lies in the extreme eastern end of the San Bernardino Valley in southern California.

It is difficult to make accurate comparisons between one major freeze event and another since major freezes do not occur very frequently, and changes may occur within the agricultural environment between events. In the Redlands District, urbanization has been a significant factor. Also, there is less frost protection practiced today than in past years, especially with respect to the use of orchard heaters. Additionally, protection done today is geared more for the marginally-cold nights and radiative frost nights as opposed to major advective, long period, major freezes.

The major freeze years in most California frost districts, including the Redlands District have been: 1913, 1922, 1937 and 1949. Moderate freezes, some causing considerable damage, have occurred regularly between major freeze events. As an example, December 1978 produced significant and widespread damage to citrus and avocados, but meteorologically it was not classified as a major freeze (see definition and differences in NOAA Technical Memorandum NWS WR-191, December 1985).

How does the freeze of December 1990 compare to past freezes? It depends on which general agricultural areas are compared. For example, for the San Joaquin Valley citrus areas, December 1990 may have been the worst freeze since 1913. In some areas, the December 1990 freeze might have been the worst freeze on record. It is safe to say this is the worst freeze in the Redlands District since the famous freeze of January 1949, making it the worst freeze to strike the frost-sensitive crops in this area over the past 41 years.

The winter of 1948-49 was very cold from start to finish. There were 10 cold nights during the last 15 days of November. A cold night being defined as a night in which the minimum temperature dropped to 32F degrees or lower at one or more of our official district temperature stations. December was even colder with 22 out of 31 nights being cold. Minimum temperatures dropped into the low to mid-20s over the Christmas period. January was even colder with 24 cold nights. February was much colder than normal with 15 cold nights during the first 19 days of the month. There were a total of 70 cold nights during the 1948-49 winter season - the record high number of cold nights since this district started recording data in 1933. The winter of 1948-49 also set a record for the most nights in which orchard heaters were used - 33 nights.

The winter of 1990-91 will have much fewer cold nights below 32F degrees and below 25F degrees than the winter of 1948-49. But, as will be shown, the duration of temperatures near-to-below critical were very similar. Critical temperatures for most citrus crops at this time of year are around 25F or 26F degrees.

When comparing this season to that of the 1948-49 season in this district, it should be noted that there was much more citrus acreage then than in 1990, and the amount of citrus (acres) protected by heaters was on the order of hundreds of times more in 1949. When heaters were used during the 1949 freeze, the entire district was warmed. Today, there is only minimal use of heaters for frost protection. Heat produced by orchard heaters today affect the temperature in only a very small area. Minimum temperatures and duration of temperatures at or below critical were highly affected by widespread heating in 1949.

There are three fruit frost service temperature stations today which are located in the same or very near the same location as they were during the 1949 freeze. These stations are: **CRAFTON HILLS, YUCAIPA,** and **PALMETTO.**

	NIGHTS =<32F	HOURS =<32F	NIGHTS =<25F	HOURS =<25F	NIGHTS =<20F	HOURS =<20F	LOWEST TEMP
CRAFTON HILLS:							
1949	14	132	7	27	NONE	NONE	21
1990	12	101	4	24	NONE	NONE	22
YUCAIPA:							
1949	16	188	7	47	4	11	18
1990	11	124	4	34	2	9	18
PALMETTO:							
1949	15	159	6	17	NONE	NONE	22
1990	12	138	10	74	4	15	17

For the **CRAFTON HILLS** station there were nearly twice as many nights in the 1949 freeze which dropped to 25F or below as in 1990, but the total number of hours (duration) at or below 25F degrees was very similar (27 hours versus 24 hours). At the **YUCAIPA** station, as with the Crafton, even though the number of nights reaching 25F degrees and 20F degrees were almost double in 1949 as in 1990, the total hours below 25F degrees and 20F degrees were similar. The **PALMETTO** station is in a very cold area. The amount of protection (especially orchard heaters) in this area is much less now than in 1949. This resulted in the large number of hours at or below 25F and 20F degrees in 1990. In 1949, frost protection continued in most orchards throughout the freeze. In 1990, there was probably a decrease in protection after the first night or so as temperatures dropped well below critical with the limited amount of heaters used.

The comparisons made between the December 1990 freeze and the January 1949 freeze show that protection methods today are not extensive enough to protect against a major freeze. Due to fuel costs, labor and pollution problems, the use of orchard heaters is not extensive enough in most areas of the district to protect citrus and avocados against a major freeze. Frost protection methods which exist today (wind machines, water and helicopters) are used to protect the crop during a short, minor freeze period and radiative frost nights.

Figures 1a and 1b compare surface sea level pressure charts for the 1949 and 1990 freeze events, respectively. Both show strong high pressure over northern Nevada and southern Idaho, typical of most major freezes in southern California.

The December 1990 freeze is definitely the worst freeze to strike this district in over 40 years. The 1949 freeze was more severe in most respects than this one. If there had been the same relatively small number of heaters used during the 1949 freeze as there were during the 1990 freeze, the 1949 freeze would have had much lower temperatures and much longer durations.

Preliminary estimates of citrus damage from the 1949 freeze was put at $20 million dollars, as 80% of the $25 million dollar citrus crop was lost. Twenty percent had been harvested or was saved by adequate frost protection. In 1990, the value of the citrus crop was placed at around $21 million dollars. Strawberries, which were not grown in 1949, also represents a highly protected frost-sensitive crop today valued at approximately $3 million dollars. Of the approximate total value of frost sensitive crops in the district ($24 million dollars), early estimates of frost damage have been placed at $11 million dollars.

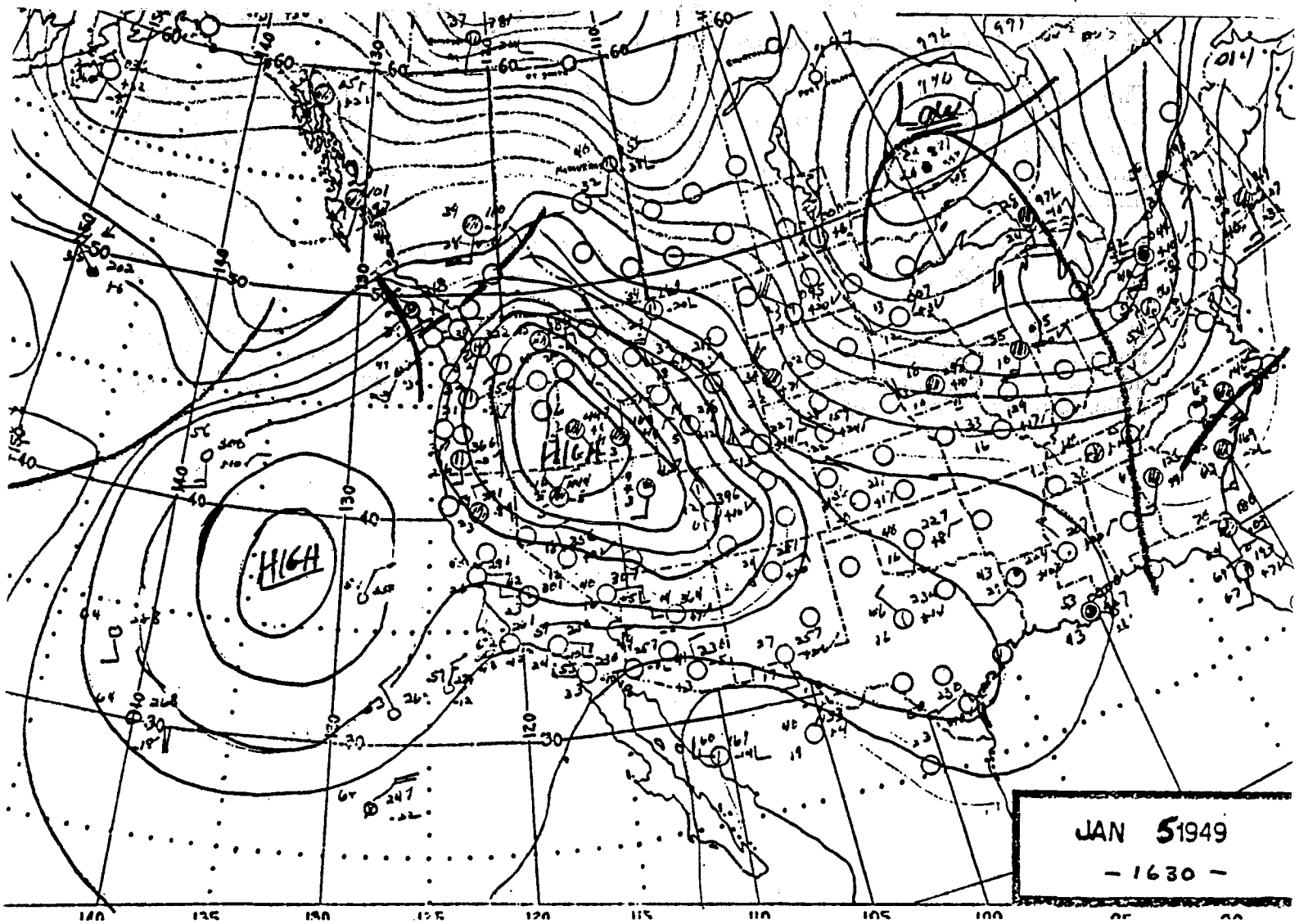

Figure 1a - Surface Sea Level Pressure
1630Z, January 5, 1949

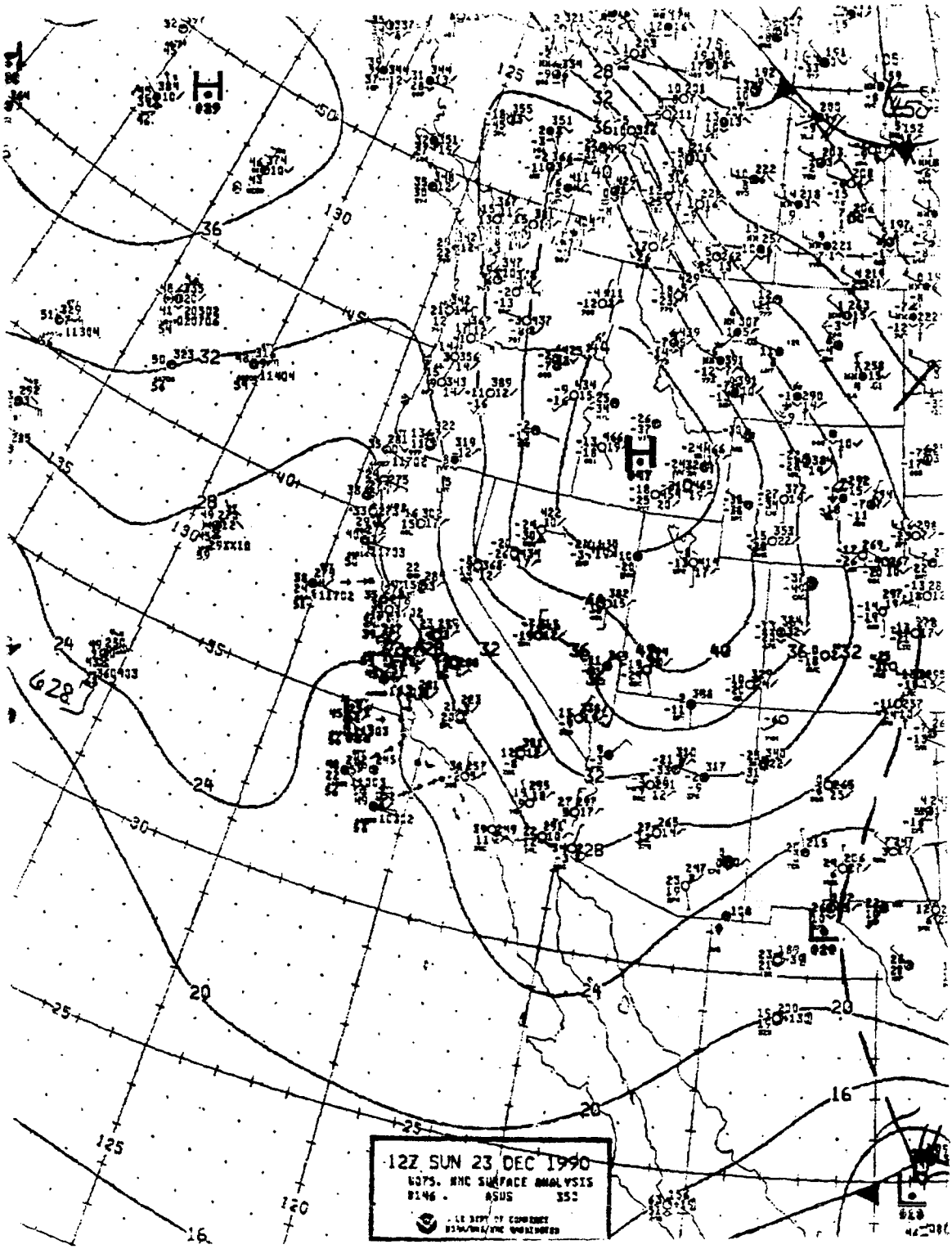

Figure 1b - Surface Sea Level Pressure
1200Z, December 23, 1990