Western Region Technical Attachment
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POTENTIAL BOMB TURNS DUD

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Intense Pacific storms can strike the Oregon coast during any month of the year. However, it is during the fall season that very intense storms, such as the Columbus Day storm of 1962 and the November 13, 1981 storm, are most likely. There are various reasons for this, a few of which include: (1) cooling of the polar regions leading to greater contrasts of warm and cold air, (2) the southward migration of the strong westerly jet over the central Pacific, (3) a remaining ridge of high pressure over the western portion of the United States, and (4) moisture from an old typhoon or tropical depression that gets drawn up into the westerlies.

On November 21, 1989, the forecast guidance from the Medium Range Forecast (MRF) model of the National Meteorological Center (NMC) from the 0000 UTC run was particularly disturbing. The 120-hour surface prog from that run showed a 986 mb low-pressure center at 42N/131W for 0000 UTC, November 26, 1989. The model developed the low from a weak tropical depression located at 18N/162E on 0000 UTC, November 22, 1989. The low was forecast to move east-northeast south of 40N, and then northeast just off the coast; a bad omen for the Pacific Northwest (Figures 1, 2, and 3).

The subsequent run from the 0000 UTC, 11/22/89 data (96-hour prog) followed the same trend, with an even deeper low (977 mb) located at 45N/131W (Figure 4). This low was also forecast to move northeast. Whoa! Two NMC runs in a row showing similar solutions! I could see my long Thanksgiving weekend with a day of "must use or lose" annual leave on Friday getting blown away by a strong jet stream across the Pacific.

WSFO Portland hoisted yellow flags and notified local Emergency Management officials and those along the coast to eat their turkey at home and not at Gramma's. "The weather pattern was changing," we alerted them, "and it could get BAD!"

Changing it was. Very cold air over Alaska was streaming out into the North Pacific. The long-wave ridge of high pressure off the coast was weakening and moving east. The westerlies had decided it was time to migrate south. Figure 5 shows a 150 kt jet stream between 40N and 45N over the Pacific on the morning of November 22. The "icing on the cake" was the remains of the aforementioned tropical depression.

Along with the intense surface low that was forecast, the MRF also had an intense trough at 500 mb for the same verifying time. Figure 6 shows a 5270m low center at 45N/134W forecast for 0000 UTC, 11/26/89. All the ingredients were in place: cold air, strong jet, an old tropical storm, autumn. I reviewed our plans for activating the Emergency Broadcast System (EBS).

NMC forecasters seemed a little leery of the development and mentioned large differences between models, with the European Model showing a high at the surface off the coast where the MRF had a low. There was a subtle difference of only 52 mb! Korty, in the NMC Map Discussion for 1800 UTC, Tuesday, November 21, 1989, indicated, "A factor in the MRF's favor is its later initial analysis which may have a better handle on the tropical depression."

The 1800 UTC, Wednesday, November 22, 1989, discussion again mentioned differences in the models and also indicated that the UK Model was now leaning towards the MRF. In that discussion Sokich/Sullivan said, "The UK solution favors the MRF solution."

However, on Thursday, November 23 (Thanksgiving Day), the MRF began backing down. It showed a 1007 mb low northeast of Hawaii near 35N/143W for 0000 UTC November 26.

The bomb was a dud! The surface analysis for 0000 UTC, November 26, 1989, (Figure 7), shows only a low of 996 mb at 45N/127W which was tracking southeast, not northeast. The 500 mb analysis for the same time is closer to what was forecast, showing a sharp trough just inside 130W with heights only 60m above forecast (Figure 8). What happened?

Most of the ingredients were there for a good storm. An intense jet stream was in a favorable location just north of 40N, and moisture and cold air were present. However, all the ingredients were not added at the right time and in the right quantities. Subtle factors hampered storm intensification.

Moisture from the tropical depression never did get entrained far enough north into the westerlies. Score one for the European Model. Movement northward of this tropical depression was inhibited by a surface high-pressure ridge to the north (Figure 9). A long-wave ridge of high pressure was not present over the western portion of the U. S. This ridge serves as part of the steering mechanism that turns deepening storms approaching the coast to the north-northeast. The subtropical high-pressure area north of Hawaii remained relatively strong. During the October 12, 1962 storm, this high was located north-northwest of Hawaii, or in a more favorable place to divert old tropical storms or typhoons into the westerlies.

What have we learned? If you are conservative, you will immediately say, "Don't hang your hat on long-range surface progs! Granted, they are improving, but are they that good, yet?" A matter of conjecture. But even the conservative has got to get a little squeamish after two successive model runs come up with similar solutions. As forecasters, we need to recognize those subtle differences that create intense storms. Some basic synoptic meteorology is involved, and drawing a few isobars is in the forefront.

The value of NMC discussions that elude to all model solutions is immeasurable. Forecasters at NMC, although not committing themselves during the discussions, did elaborate on the differences. Addition of the 120 hr forecasts from the ECMWF and UKMO will help in providing solutions to long-range problems. But in the end, a thorough analysis of the present situation, using all available guidance, will lead to the best forecast.

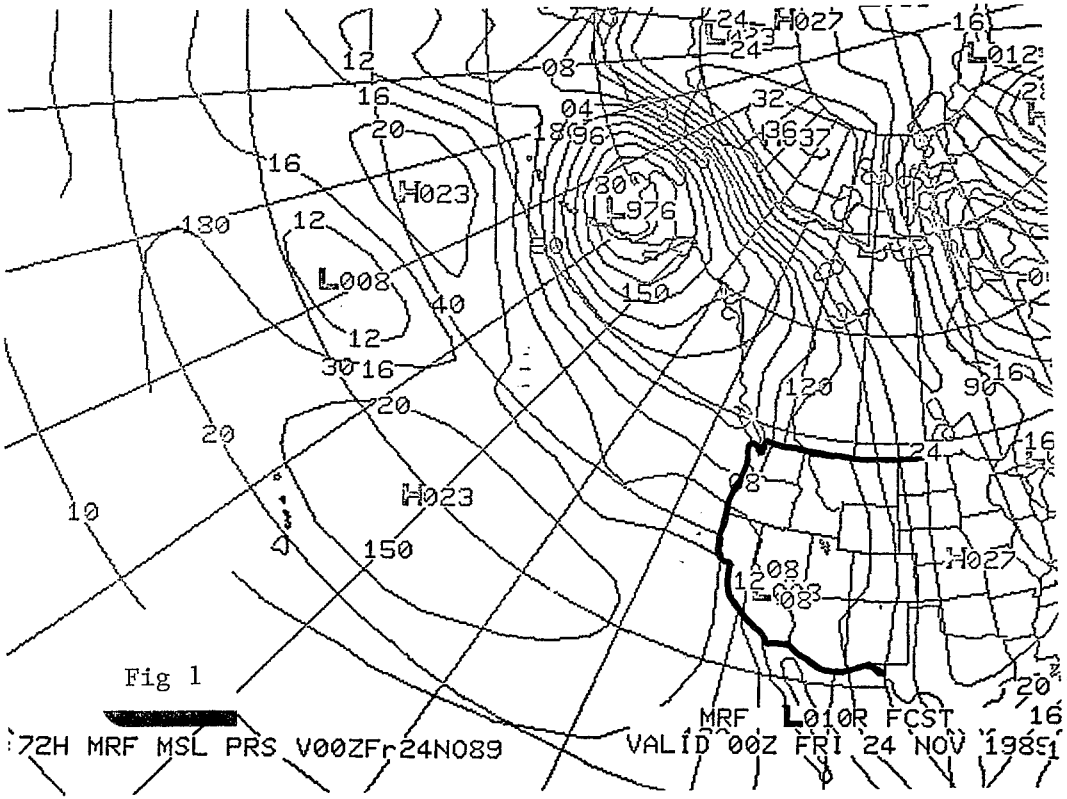

Fig 1

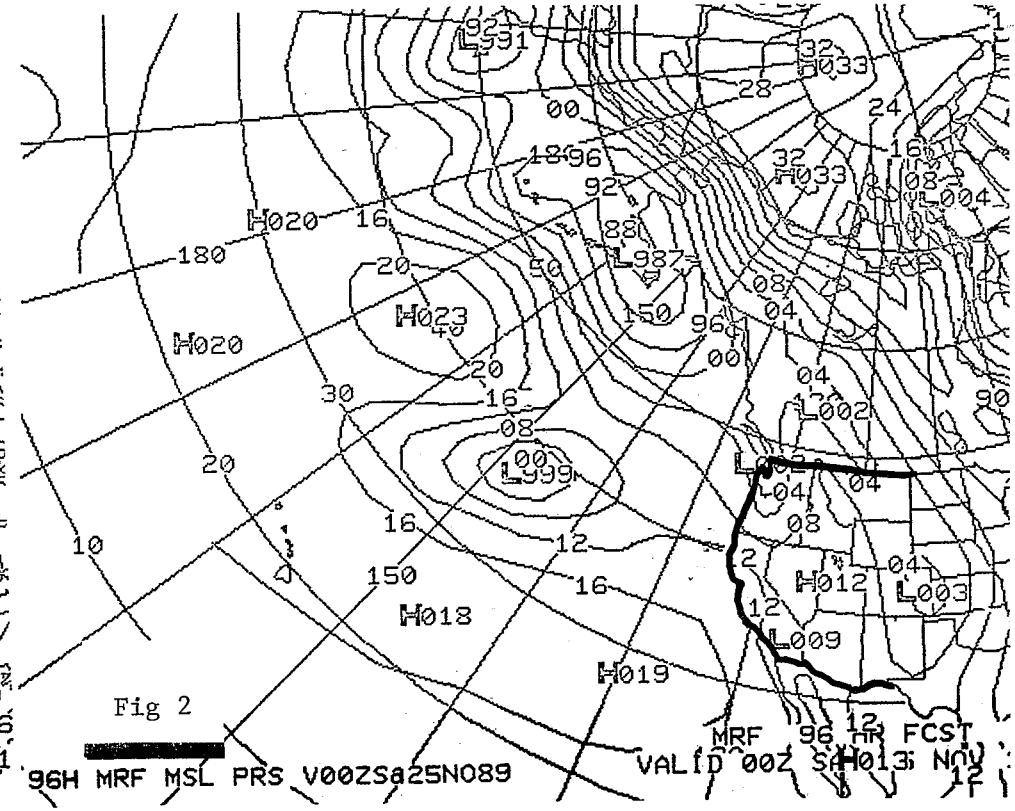

Fig 2

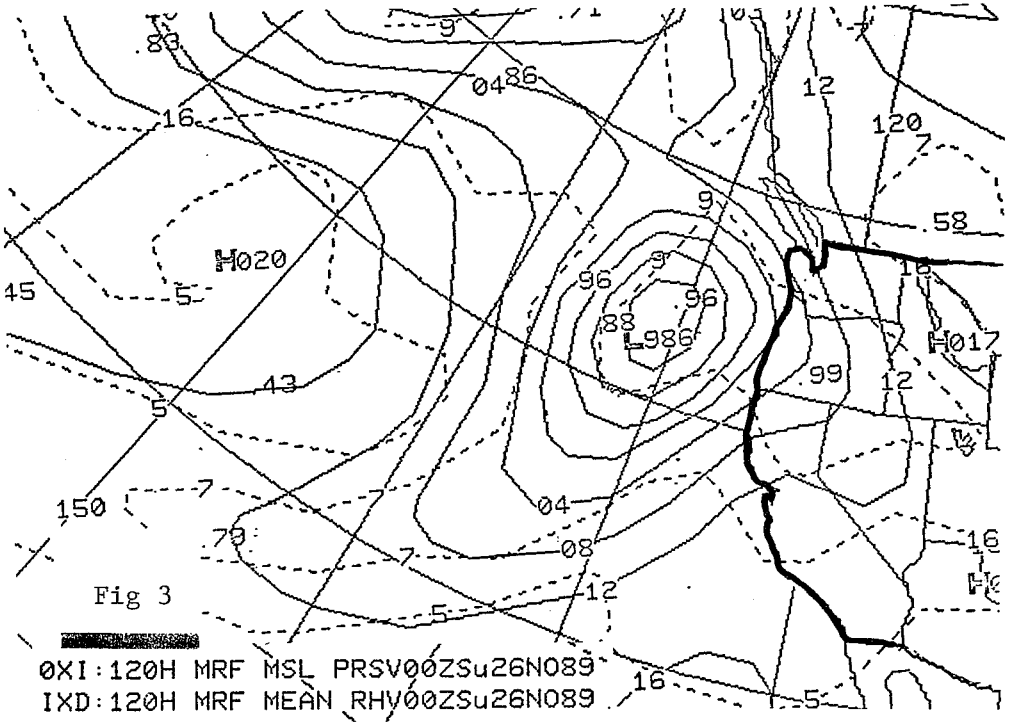

Fig 3

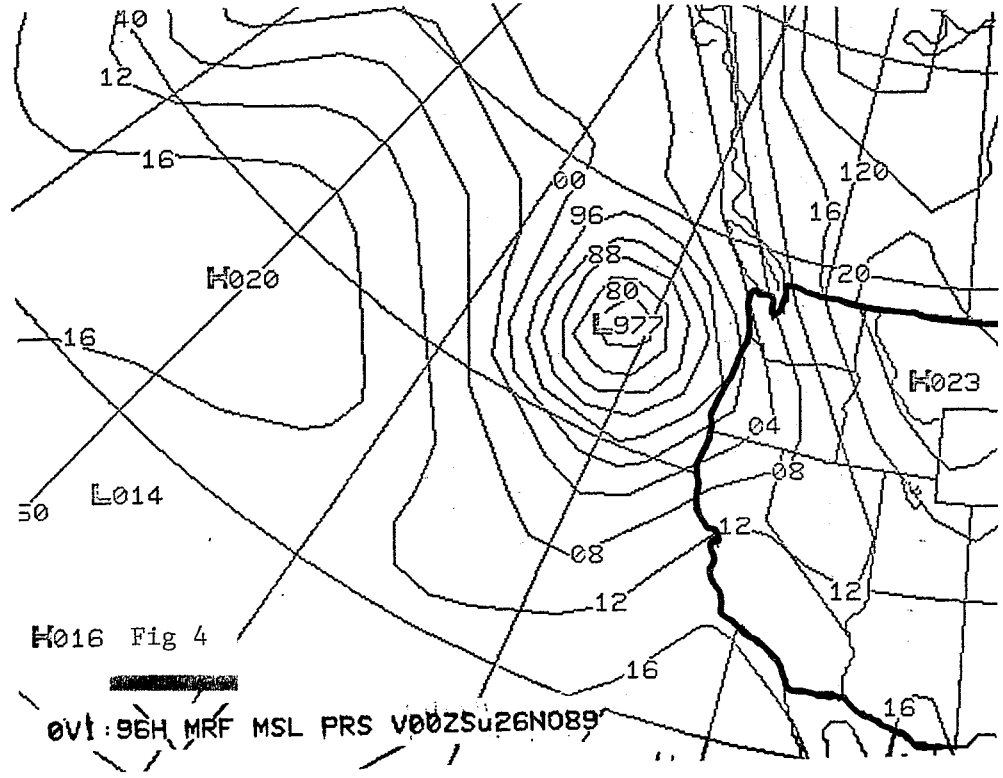

Fig 4

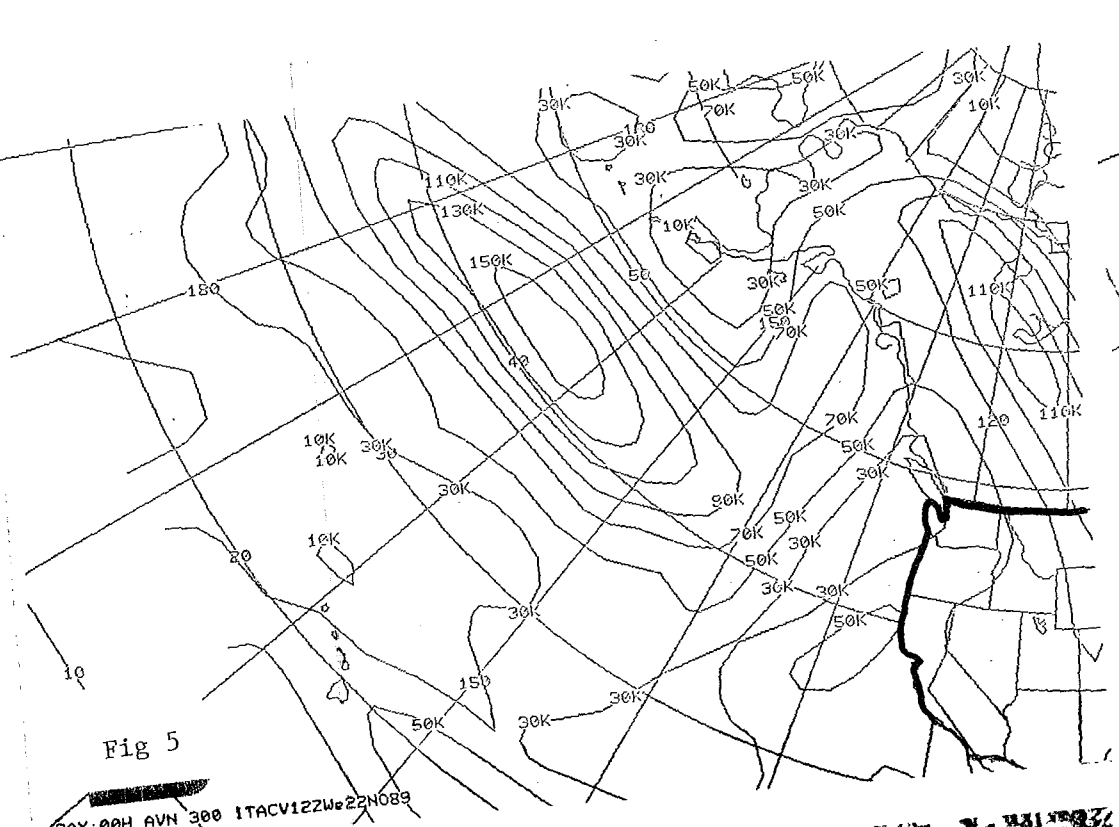

Fig 5

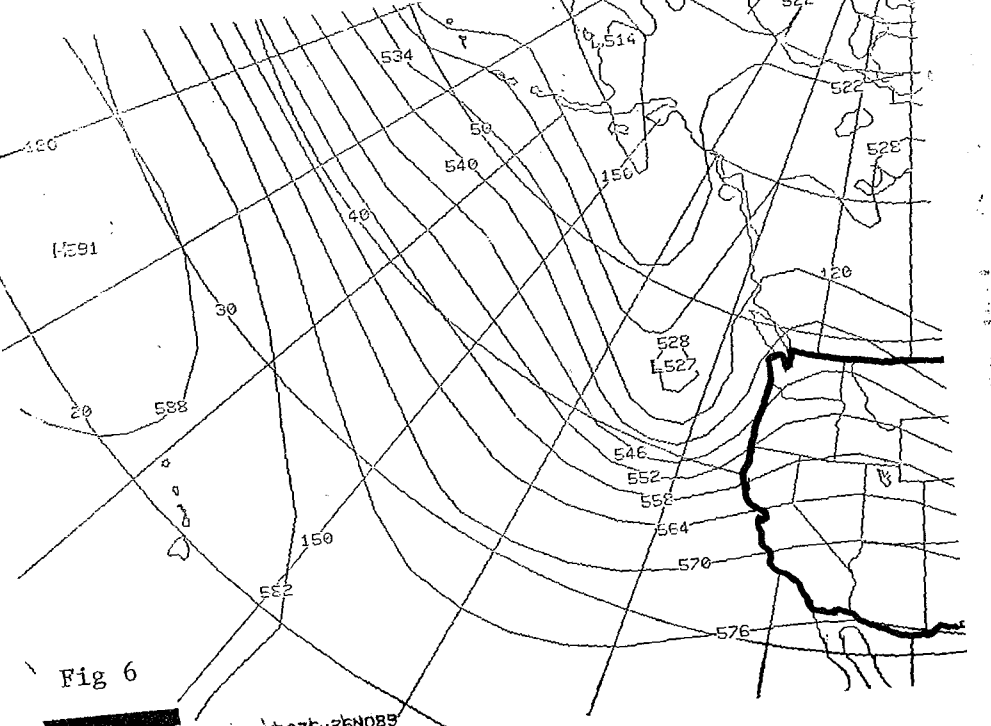

Fig 6

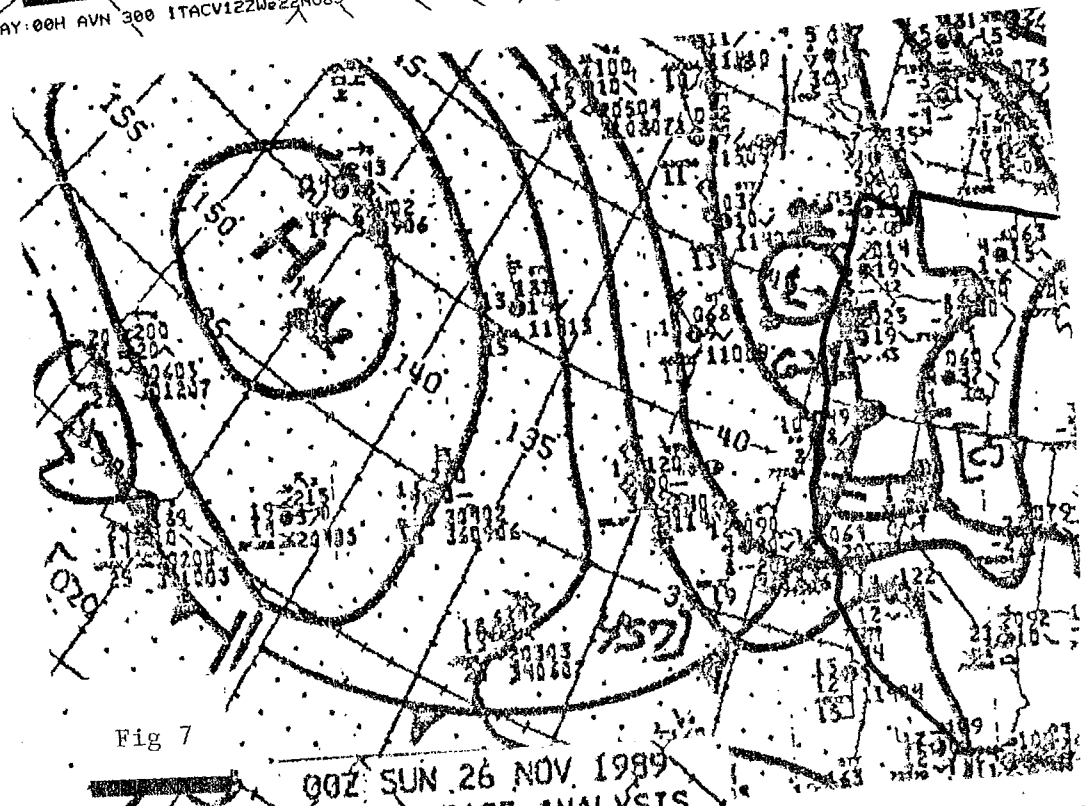

Fig 7

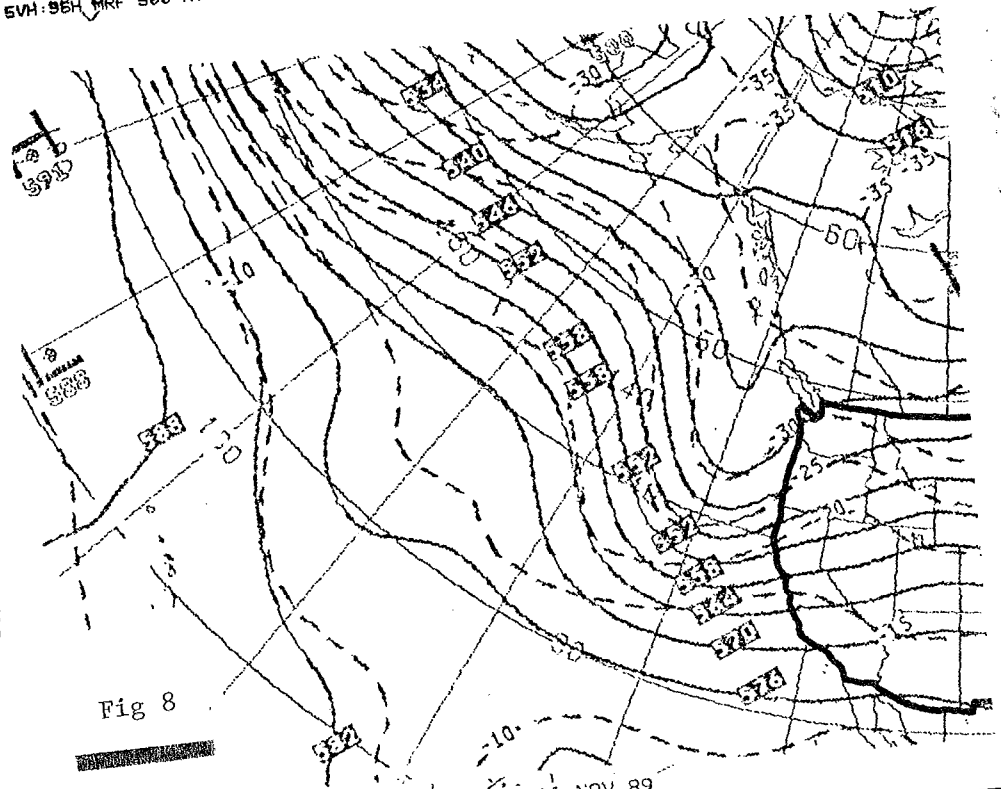

Fig 8

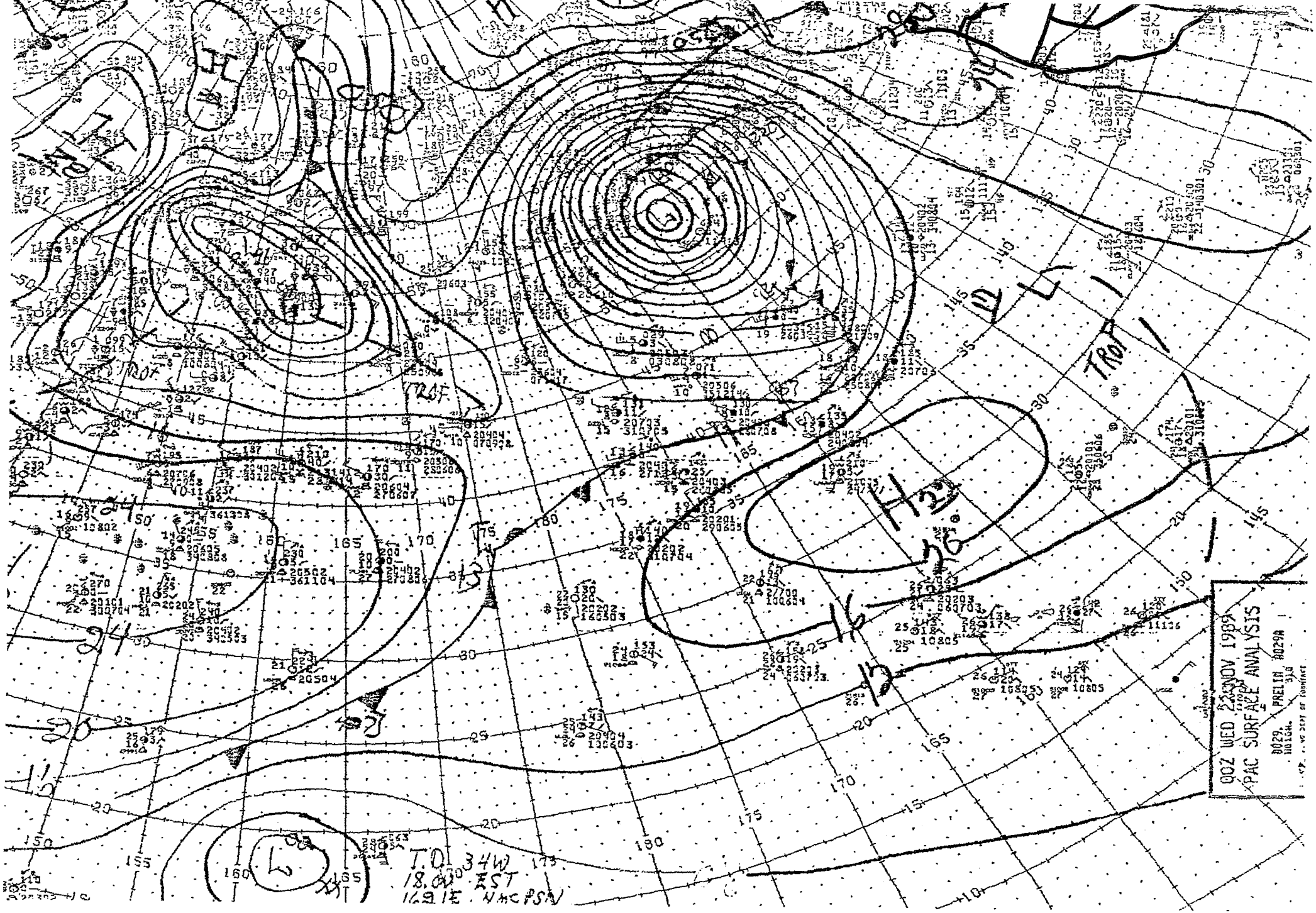

Fig 9

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