The State of the N.E. Pacific Ocean January-June 1997

Howard Freeland
Institute of Ocean Sciences
Sidney, B.C. V8L 4B2, Canada

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Figure 1a, b, and c shows the monthly mean sea-surface temperature (SST) anomalies in the eastern North Pacific from January 1997 through February 1998. The period was dominated overwhelmingly by the surprising events developing in the equatorial Pacific. The development of the 1997/98 El Niño was a surprise by itself, but the development so very early in the year was nothing short of astonishing.

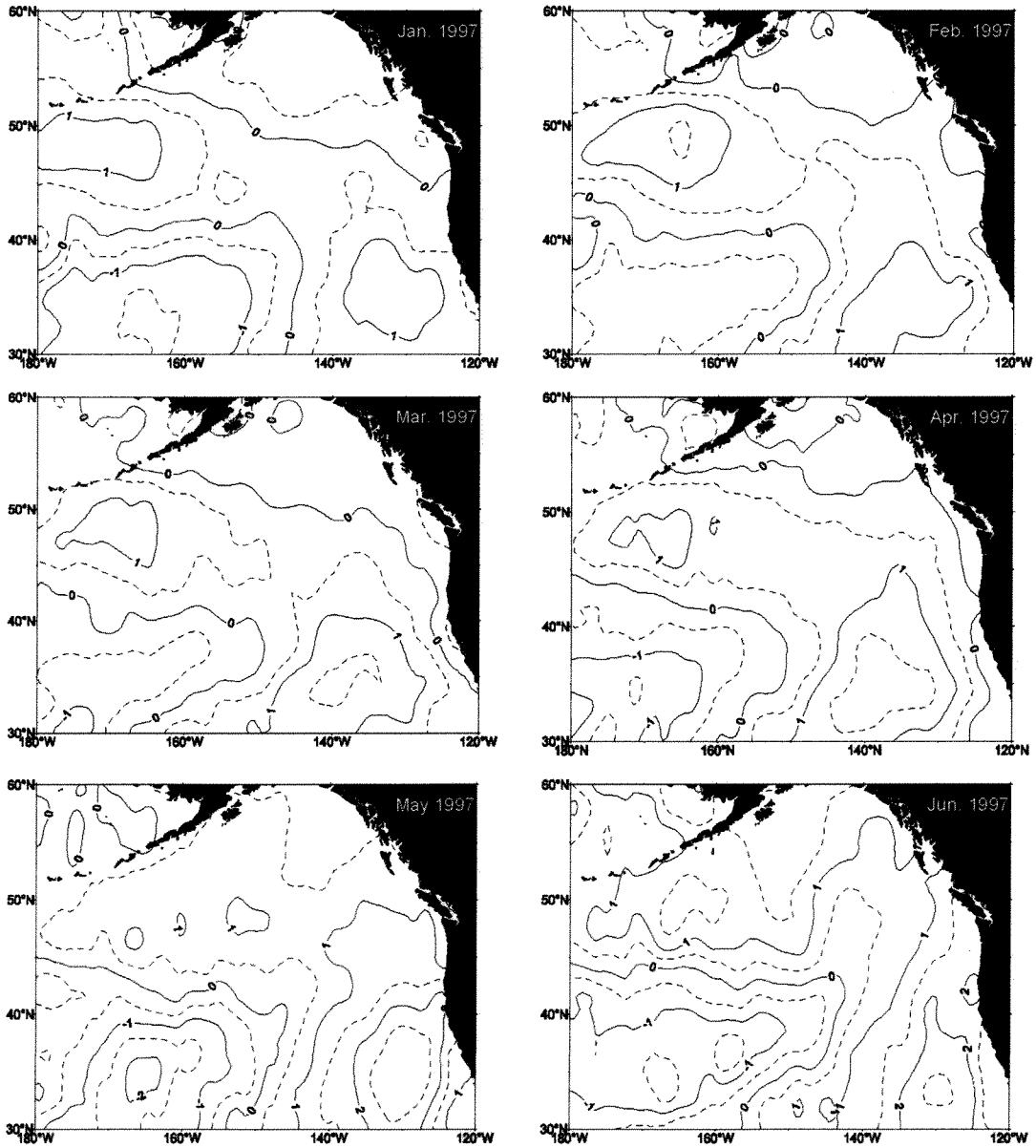

Fig. 1a. Monthly mean sea-surface temperature anomalies for the eastern North Pacific Ocean, from January through June 1997, inclusive. The solid contours are at intervals of 1°C, and dashed contours at intervals of 0.5°C.

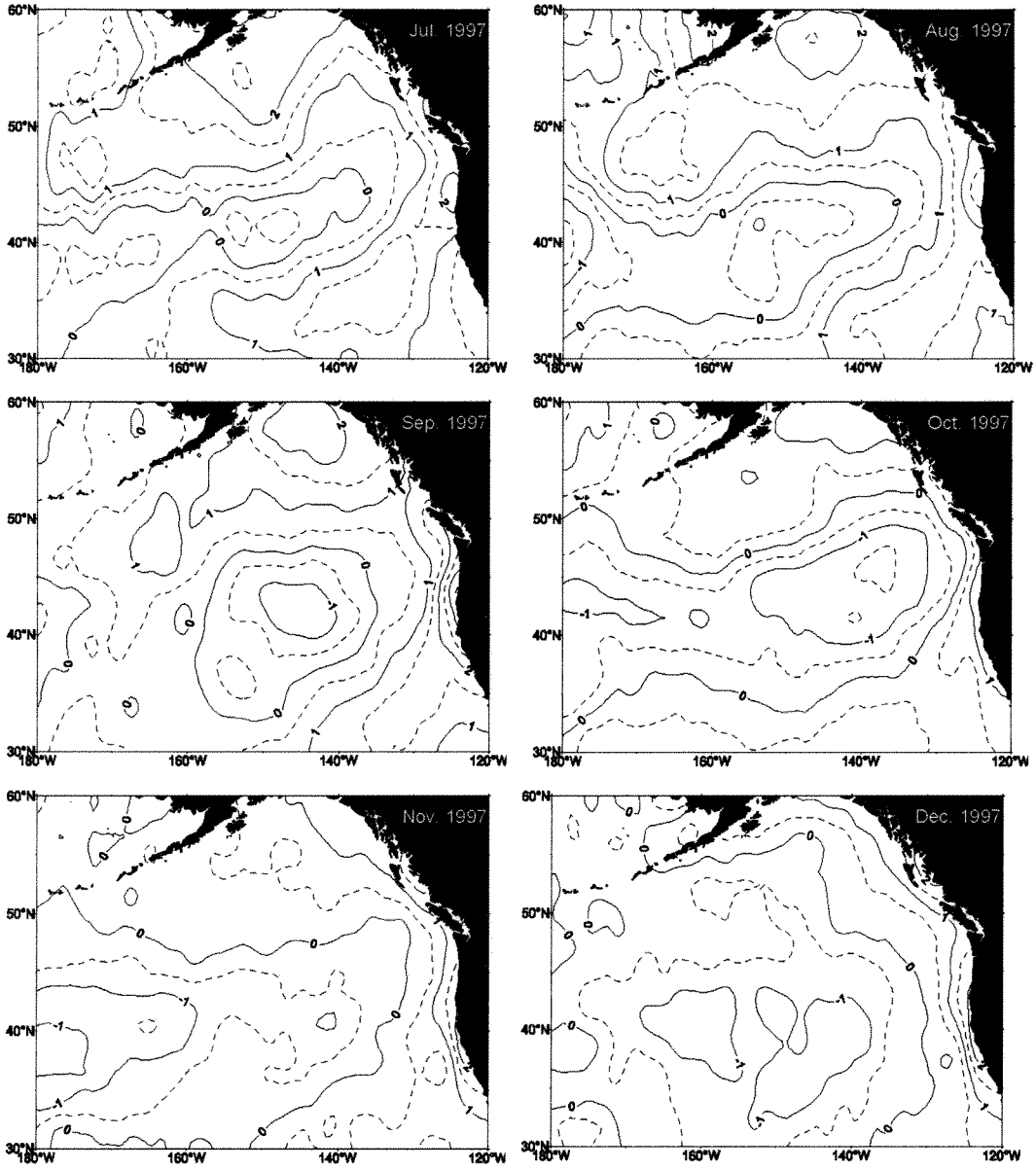

Fig. 1b. Monthly mean sea-surface temperature anomalies for the eastern North Pacific Ocean, from July through December 1997, inclusive. The solid contours are at intervals of 1°C, and dashed contours at intervals of $^1/_2$°C.

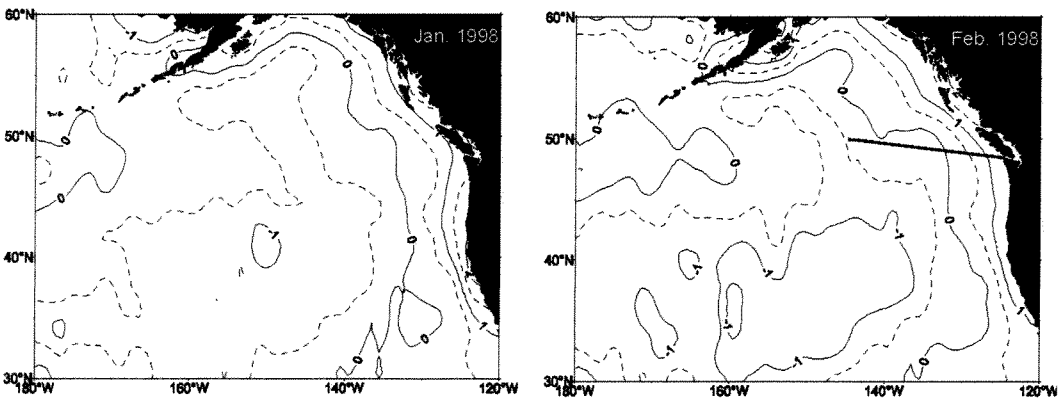

Fig. 1c. Monthly mean sea-surface temperature anomalies for the eastern North Pacific Ocean, from January through February 1998, inclusive. The solid contours are at intervals of 1°C, and dashed contours at intervals of 0.5°C.

The SST anomalies show that conditions were close to normal at the beginning of 1997 (Fig. 1a, b, and c). In the Gulf of Alaska, SSTs were even marginally below normal in January through April. In March, the first indications of an incipient El Niño became apparent to anyone who was watching sea-level changes on the equator. The event developed with great rapidity. By May 1997 extreme warm anomalies appeared off California, while SSTs remained near normal in the Gulf of Alaska (Fig. 1a). By June the anomalies penetrated through the entire northeastern Pacific, and were heading towards the dateline along the Aleutian Islands. The pattern of anomalies displayed in June 1997, positive SST anomalies around the coast of North America, and negative anomalies in the central Pacific, is the classic pattern of response of the northeastern Pacific to El Niño forcing. This pattern is observed in response to all El Niño events.

The most intense anomalies shown here occurred in September 1997 (Fig. 1b). In support of that, at the B.C. lighthouses (where sea surface temperatures have been observed daily for 65 years) the highest monthly mean surface temperatures ever recorded were observed at the west coast stations in September. Though anomalies off western Canada remain high, the tongue of high SST that previously extended along the Aleutians past the dateline shows evidence, in early 1998, of retreating to Kodiak Island.

Figure 2 shows a plot of the subsurface temperature anomaly field observed during the outbound trip along Line-P during February 1998. Line-P extends from the mouth of the Juan de Fuca Strait (southern Vancouver Island) to Ocean Station Papa at 50°N and 145°W, and is indicated by a bold line on the February 1998 panel on Fig. 1c. The section is in general agreement with the sea surface temperature chart for February indicating near-normal conditions along most of Line-P. Also in agreement with the surface maps, the largest anomalies are close to the coast of Vancouver Island. However, the surface chart is striking in that it shows the largest anomalies subsurface between depths of 100 m and 200 m. In this respect the anomaly pattern is very similar to the anomalies observed along Line-P in March 1983.

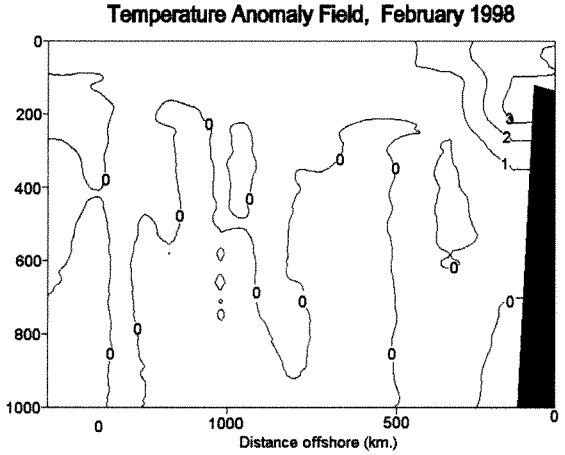

Fig. 2. Temperature anomalies observed during the February 1998 Line-P cruise.

The sea-level response demonstrates the magnitude of the impact of the 1997/98 El Niño on the coast of British Columbia. Sea level is standing, as of early March 1998, about 35 cm above normal. This anomaly is larger than the anomaly that occurred in 1983, and indeed has set new record anomalies around the coast of British Columbia.

Finally, no discussion of the state of the Pacific Ocean would be complete without some speculation about what the future holds. Figure 3 shows a plot of the southern oscillation index (SOI) observed daily by the Queensland Department of Natural Resources and the Department of Primary Industries in Australia. By mid December 1997, the southern oscillation index had returned close to normal. However, through January there was a slow trend towards increasingly negative values culminating at the end of January and beginning of February in a large "westerly wind burst." This burst of El Niño-like activity on the equator was also clearly visible in the wind field observed on the equator by the Tropical Atmosphere-Ocean array. Since then, the index has fluctuated but remained persistently negative.

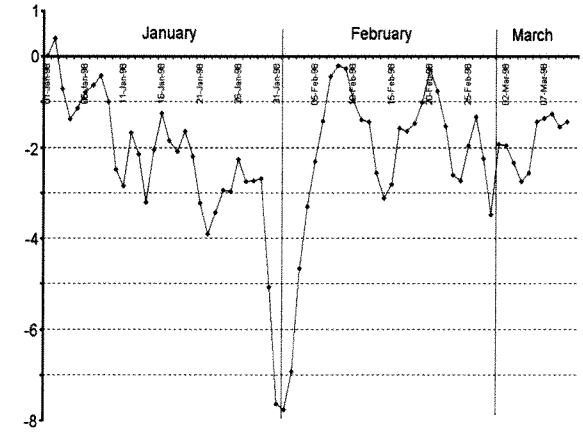

Fig. 3. Daily values of the southern oscillation Index from January 1st 1998 to present.

Thus it is too early to claim that the 1997/98 El Niño is over, even on the equator. At higher latitudes, SSTs remain high over large regions of the North Pacific. Further, the positive anomalies are distributed well down in the water column. The excess heat cannot be removed from the ocean in short order, thus the 1998 fishing seasons in the N.E. Pacific will be influenced by the 1997/98 El Niño.