The Global Climate of June 1992-February 1993

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I. Introduction

The global climate has been monitored routinely at the Climate Analysis Center, NMC/NWS/NOAA. In this note, I will review recent development of the ENSO event and related atmospheric and oceanic circulation features. The extratropical high-lights during that period will also be discussed.

II. Tropical conditions

Figure la plots the time longitude section of monthly mean sea surface temperature (SST) for 5 °S to 5 ° N from June 1990 to March 1993. The corresponding SST anomalies were also plotted in Fig. 1b to show the evolution of the recent ENSO event. The warm ENSO episode, which began to develop during September 1991 and reached its mature phase (Kousky 1993) duing the Northern Hemisphere winter of 1992, started to show signs of weakening during March-May 1992 (Wang 1993). In October 1992, most atmospheric and oceanic circulations indicated near normal conditions in the tropical Pacific. However, during November 1992, convection in the central Pacific again intensified near dateline to indicate the returning of the warm episode conditions. The warm episode continued up to the present.

In the beginning of May 1992, positive SSTA of greater than 2 °C remained in the eastern Pacific and positive SSTA greater more than 3 °C were observed along the coast of Peru during May 1992. In June, a narrow band of negative SSTA (Fig. 2a) appeared along the equator in the eastern Pacific as the cold tongue in SST began to be established west of South America coast. The cold tongue generally develops in that region during June and reaches maximum intensity during September as part of the seasonal cycle in SST (Mitchell and Wallace 1992). A rapid decrease in SSTA was observed in the equatorial Pacific (Fig. 1) while the cold tongue of SST intensified and expanded toward the central Pacific throughout the JJA season. During August, SSTA less than -1 °C appeared in the eastern Pacific with positive SSTA greater than 1 °C just north and south of the Equator. Only in the western equatorial Pacific Nino 4 region did positive SSTA greater than 1 °C persist throughout the JJA season.

In the beginning of November, convection in the central Pacific again increased near dateline. Positive SSTA (Fig. 2b) of about +1 ℃ were observed in that region. At the same time, the oceanic thermocline deepened in the eastern Pacific and the Southern Oscillation Index (standardized sea level pressure difference between Tahiti and Darwin) became strongly negative. The warm episode conditions in the tropical Pacific continued during the Northern Hemisphere winter. By the end of March 1992 (Fig. 2c), SST anomalies were greater than 2 °C in the region just south of the equator from the South American coast westward to 115 °W and near 4 °C along the coast of Peru.

The depth of the oceanic thermocline along the Equator (Fig.3), in the region between 160 °W and 90 °W, became shallower during the period from February-May. There was an additional 40m rise in the thermocline between May and June 1992 and thereafseason (Fig.3). This pattern is similar to that observed during the decay stage of the 1987 warm episode. However, the deepening of the thermocline began near 160 °W in November and gradually spread eastward to the South America coast. During March, the thermocline depth was shallower (deepen) than normal in the western (eastern) Pacific, which is characteristic of the warm ENSO event.

III. Extratropics

The highlights of extratropical circulation during this study period will be reviewed in this section.

A. Extreme temperature variations in the Northern Hemisphere during JJA

During the Northern Hemisphere summer (JJA), below normal temperatures dominated the land mass regions in midlatitudes except in Europe where above normal temperatures persisted throughout the summer season. Figure 4 plots the virtual temperature anomalies at 500 mb. Above normal 500 mb temperatures persisted over Europe and in the subtropics, while below normal temperatures covered most regions in the NH middle and high latitudes. Negative temperature anomalies less then -1 ℃ can be found in the North Pacific and North Atlantic. In the Pacific just north of the equator, positive temperature anomalies were observed in the same region where positive SSTA were located. The unusual coolness during this season could be associated with the June 1991 eruption of Mount Pinatubo.

B. Indian summer monsoon

Figure 5 plots the precipitation percentiles for JJA. It indicates normal rainfall over the Indian subcontinent and above normal rainfall along the Arabian sea coast. The Indian monsoon season stared in the mid-June, which was later than usual. Most parts in northern Indian and Pakistan had below normal rainfall during June and earlier July. From July 11 to the second week of September, there were several active spells with good rainfall over northwestern part of Indian and Pakistan as well as over eastern and southeastern Indian, which made up for the rainfall deficiency and resulted in normal rainfall for the season.

C. Australian monsoon

During the DJF 1993, the intraseasonal oscillations were very regular and strong, which modulated the Australian monsoon. The seasonal mean rainfall map indicates a wetter than normal monsoon season in Australia.

References

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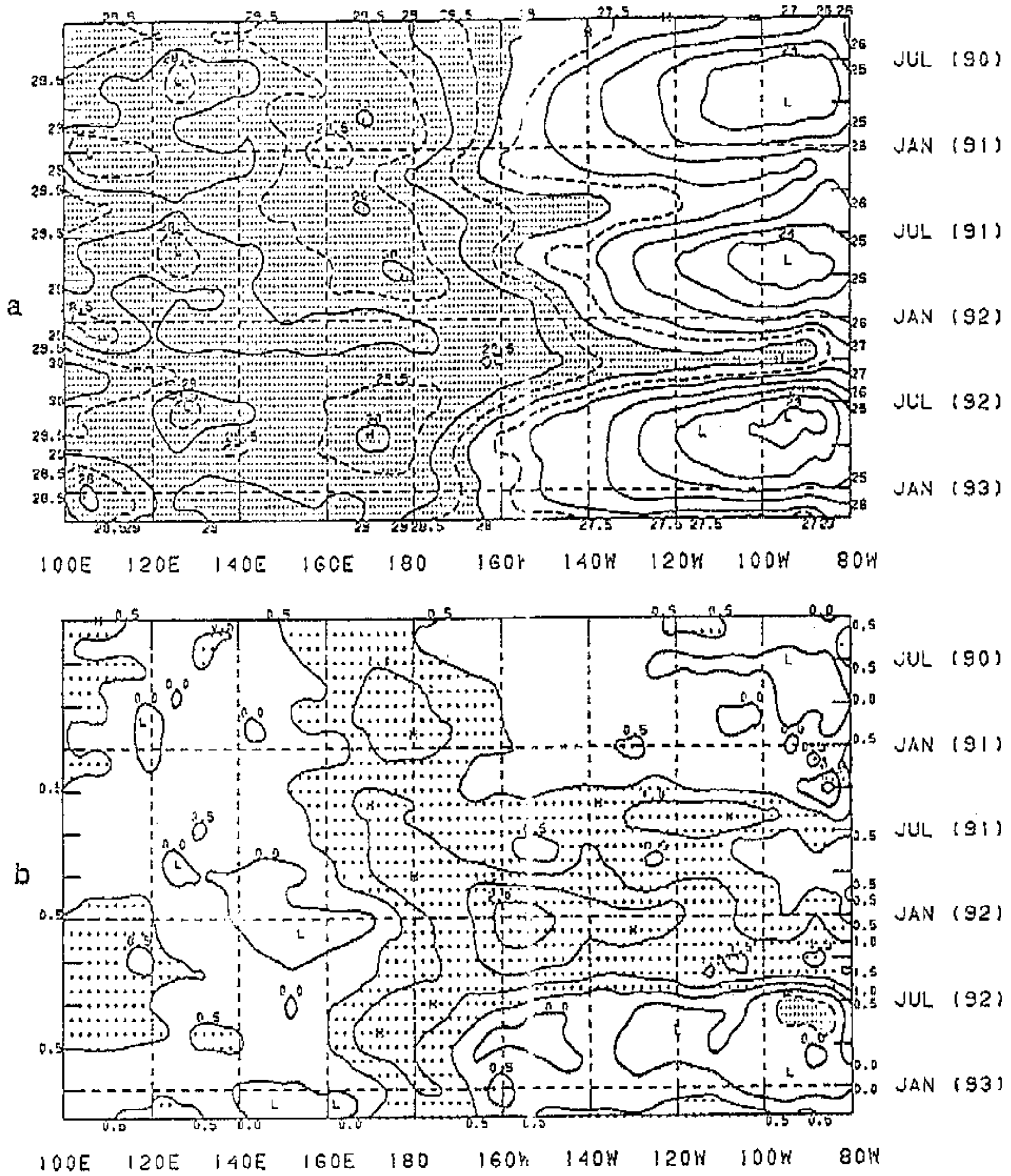

Figure 1 Time-longitude section of monthly (a) sea surface temperature and (b) anomalous, for 5°N -5°S. Contour interval is 1° and 0.5°C respectively. SST anomalies less than -0.5°C are shaded. Stippled areas indicate anomaly values greater than 0.5°C. Anomalies are computes based on the COADS/ICE climatology (Reynolds 1988).

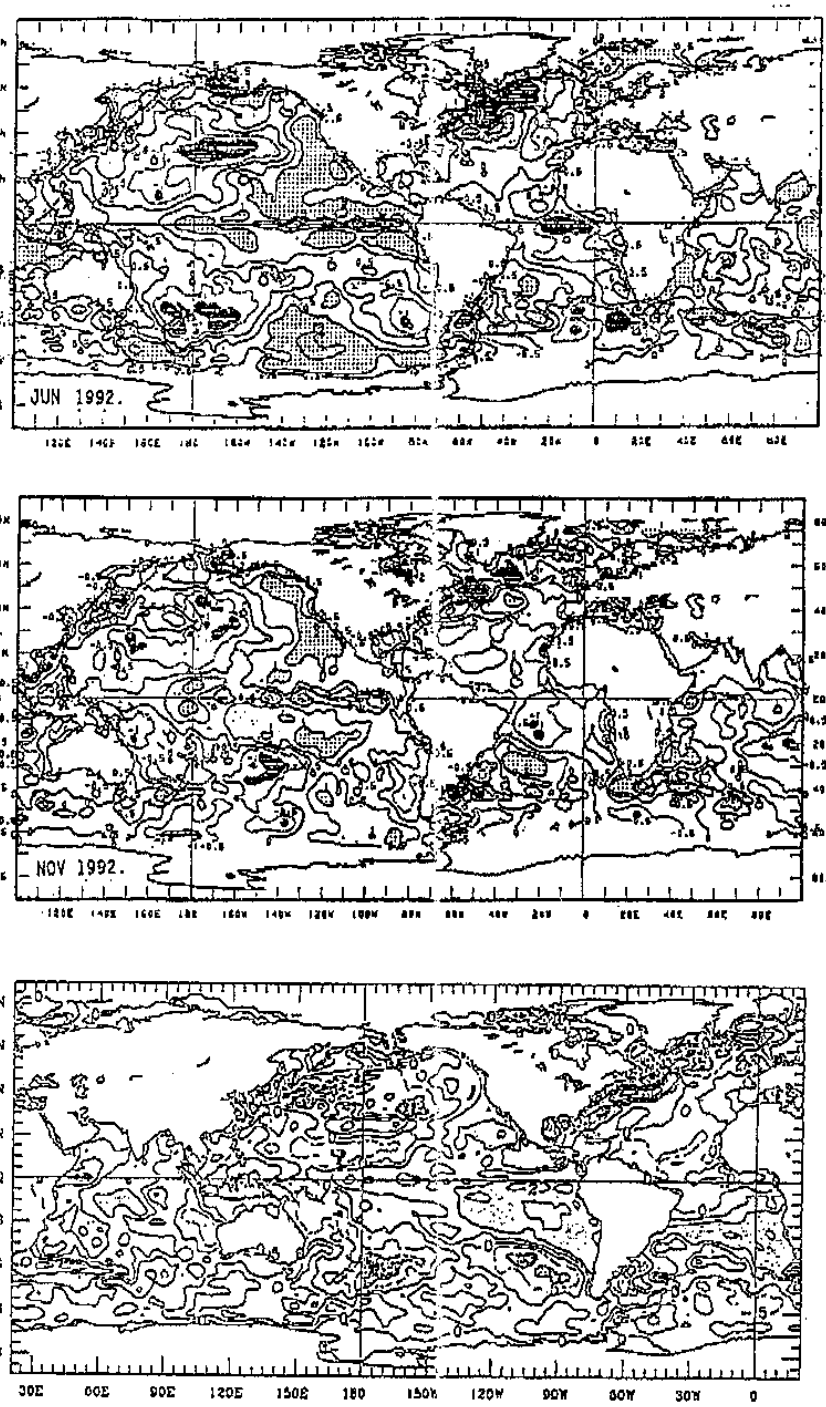

Figure 2. Sea surface temperature (blended analysis) anomaly, for (a) June 92 (b) November 1992 and (c) 28 March- 3 April,1993 analyzed on a 2.5° grid. Anomalies are computed as departures from the COADS/ICE climatology (Reynolds 1988). Anomaly contour interval is 1°C.

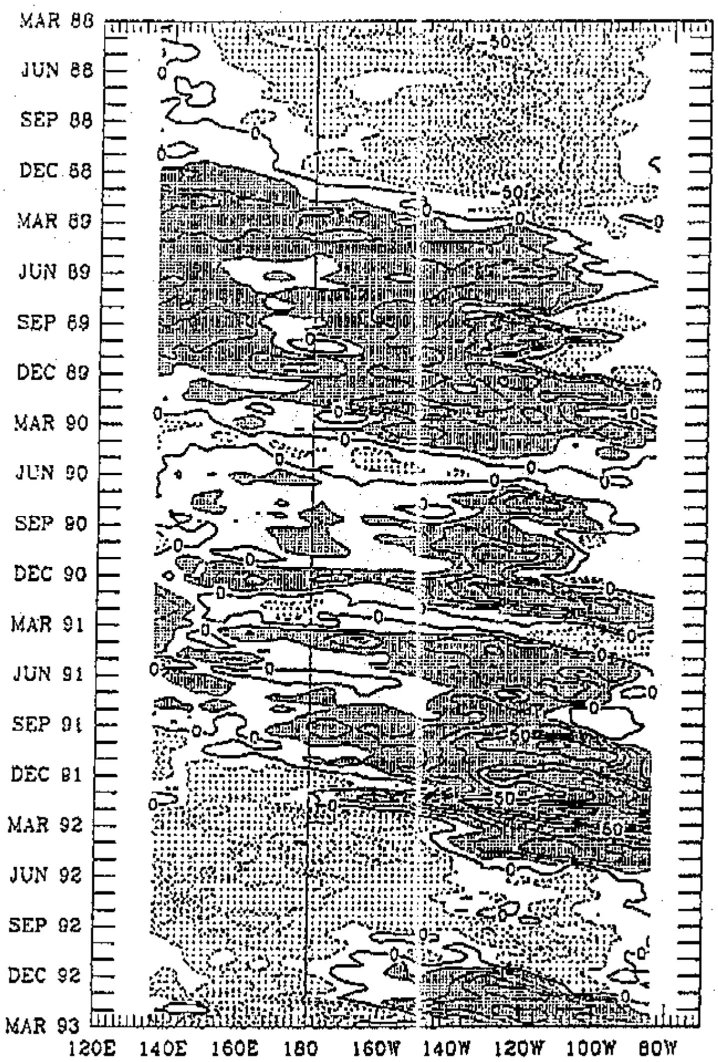

Figure 3 Anomalous depth of the 20°C isotherm along the equator in the Pacific ocean. Data are derived from an analysis system which assimilates oceanic observations into an oceanic GCM (Leetmaa and Ji, 1989 Dym. Atmos. Oceans, 13, 465-490). The contour interval is 10 m . Anomalies are computed as departures from the 1985-1990 base period

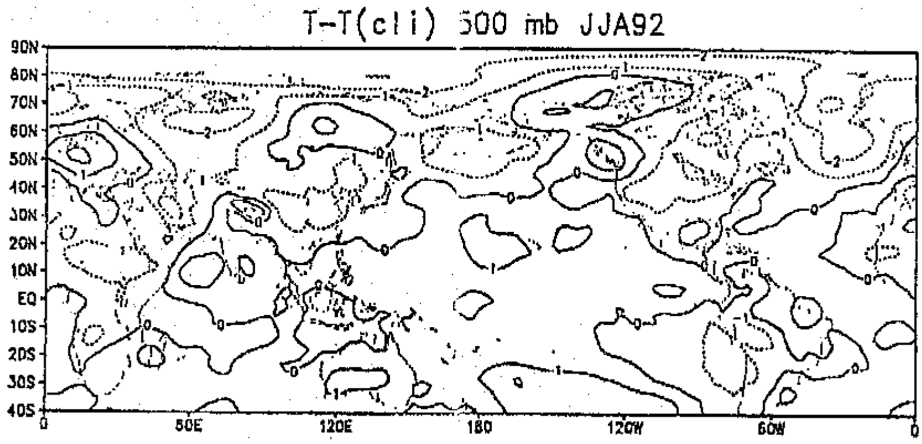

Figure 4 500 mb virtual temperature anomalies for JJA 92. Anomaly is departure from 1979-1988 base period. The contour interval is 1.0°C

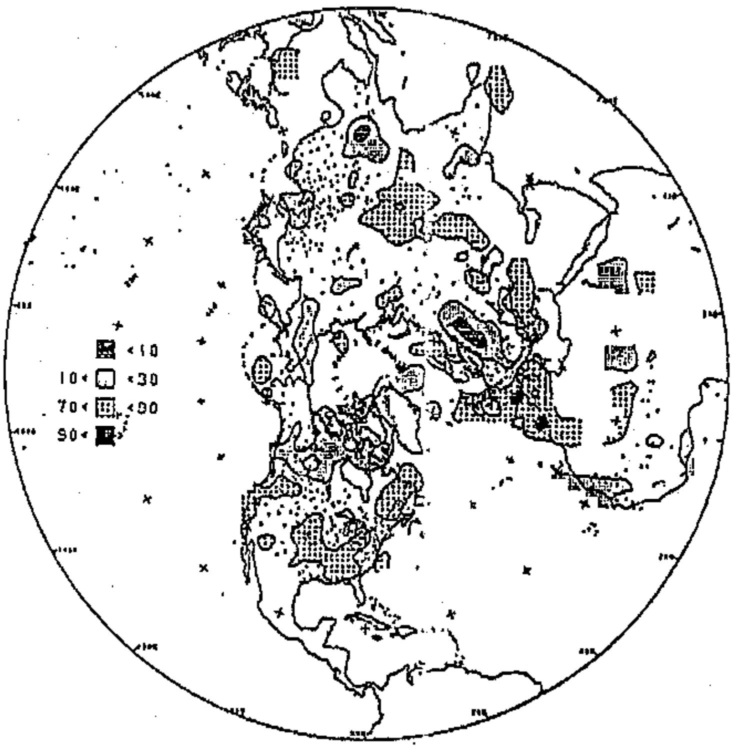

Figure 5: Northern Hemisphere precipitation percentiles for JJA 92. Percentiles are computed based on a fit of a Gamma distribution to the 1961-1990 base period precipitation data. Contours are drawn for the 10th, 30th, 70th and 90th percentiles. Station locations are denoted by small "+". Those stations with zero median precipitation are designated by a large "X". No analysis is done in areas with insufficient data.