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World Meteorological Organization

El Niño Update

INTRODUCTION

WMO has produced this El Niño Update in order to summarize information obtained from the national Meteorological and Hydrological Services (NMHSs) of WMO Member States and affiliated organizations. Previous Updates gave general background information about El Niño.[1] This issue focuses on the current state of the 1997–1998 El Niño event, and on forecasts and potential impacts for the coming season. Information contained herein is current as of 21 January 1998. More information is available on WMO's Home Page (http://www.wmo.ch).

SUMMARY

This is the strongest El Niño event on record, developing more quickly and with higher temperature rises than ever recorded. The current El Niño episode developed very rapidly throughout the central and eastern tropical Pacific Ocean during April and May 1997, reaching strongest intensity by June 1997. During the second half of the year, this episode became even more intense than the major El Niño of 1982–1983, with sea-surface temperature (SST) anomalies across the central and eastern Pacific of 2–5°C above normal. SSTs exceeded 28°C across the central and east-central equatorial Pacific beginning in May 1997, as the normal cooling of ocean waters typical of June–October 1997 was notably absent.

By 8 January 1998, the volume of El Niño's warm water pool had decreased by about 40 per cent since its maximum in early November 1997. However, the surface area of the El Niño warm water pool in the Pacific is still about 1.5 times the size of the continental United States. This warm pool has so much energy that its impact will continue to dominate world climate patterns through to mid-1998. Further warming in the eastern Pacific is unlikely during the coming months.[2] The warming effect of El Niño was a major factor contributing to the record high global temperature in 1997.[3]

It has been suggested that the forest fires in Indonesia that spread smoke and haze throughout south-east Asia since August 1997 were due in part to El Niño's impact on the region. Assessments of the latest satellite pictures and weather reports have indicated that the region is now generally clear.

What is the current status of El Niño?

With abnormal tropical convection over the eastern Pacific and stronger westerlies in the lower mid-latitudes of both hemispheres, this El Niño is showing typical features of the mature (or strongest) phase of warm episodes.[4]

Warm episode conditions continued to dominate the tropical Pacific during December 1997 and the first half of January 1998, with SSTs exceeding 28°C throughout most of the equatorial Pacific. SST anomalies exceeded +1°C throughout the equatorial Pacific east of the date line and exceeded +5°C east of 120°W. The Southern Oscillation Index (SOI) increased from –1.4 in November 1997 to –1.2 during December 1997. Within the Niño 3 region (5°N–5°S, 150°W–90°W), SST anomalies rose marginally from 3.7°C to 3.9°C above normal in November 1997. Figure 1 shows the pattern of SST and anomalies for December 1997.

How strong is this El Niño?

Temperature anomalies for this event are higher in the central equatorial Pacific as compared with the 1982–1983 event. In fact, since August 1997 the SST anomalies in the equatorial Pacific Ocean have been unprecedented for the same time period in the last 50 years. Although this El Niño started developing during the same time of year as the previous events, it developed more rapidly, reaching maximum intensity in June 1997. An analysis of all the variables — pressure, wind, temperature and cloudiness — show that this El Niño's strength, amongst the six strongest events in history, is comparable with the 1982–1983 major event.[5]

What is the forecast for the 1997–1998 El Niño?

The forecasts from most major prediction centres indicate that warm episode conditions will continue through March–April–May 1998, followed by a weakening of the warm episode. Some models indicate a switch to a cold event (La Niña) beginning during

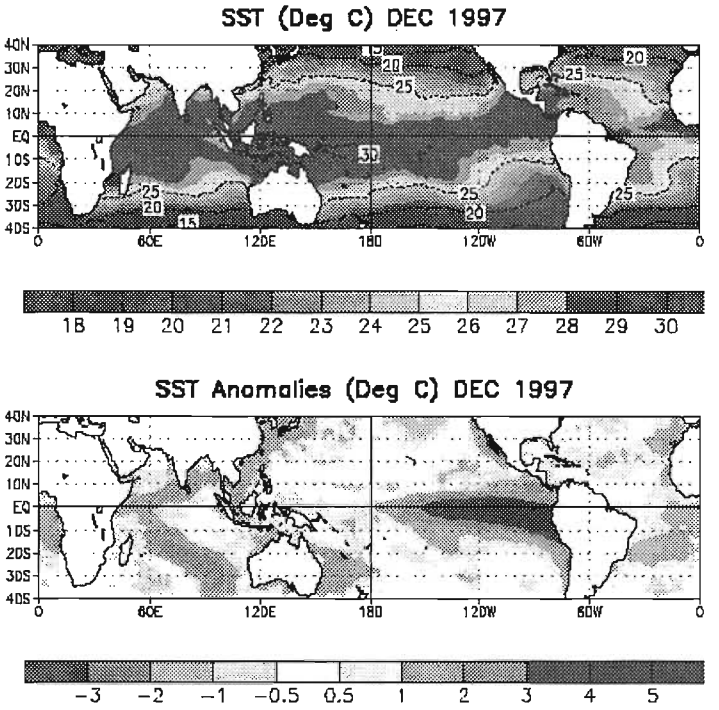

Figure 1 — Sea-surface temperatures, mean (top) and departures from normal (bottom), for December 1997. Contour interval is 1°C. Departures from normal are computed based on the 1950–1979 adjusted climatology (http://nic.fb4.noaa.gov/products/analysis_monitoring/enso_advisory/advfig1.gif)

July–September 1998. Figure 2 depicts SST averages for October–November–December 1997 and the predicted anomalies for three-month intervals starting with January–February–March 1998.[6]

What are the impacts of the 1997–1998 El Niño?

Typical impacts of El Niño across the globe are shown in Figure 3. Areas where El Niño causes anomalous temperature or precipitation patterns are indicated. These are based on results of previous studies on warm episodes. For the next season, drier-than-normal conditions over Indonesia, eastern Australia, northern South America and southern Africa during the next few months can be expected. Wetter-than-normal conditions should continue over the central and eastern equatorial Pacific, along the coasts of Ecuador and northern Peru and over south-eastern South America. Also, increased storminess and wetter-than-normal conditions are expected over California and the southern third of the United States, with warmer-than-normal conditions along the northern third of States.[7]

What are the impacts in Asia and the Western Pacific?

El Niño greatly enhanced tropical convection and precipitation during December 1997 across the central and eastern equatorial Pacific, and suppressed precipitation over ***Indonesia***, the ***western Pacific*** and the ***eastern Indian Oceans***. This pattern of anomalous convection has persisted since May 1997.

Significant rainfall deficits remain in ***Indonesia*** and the ***Philippines*** despite a relatively wet week at the beginning of January 1998. Total rainfall in all of ***Thailand*** was well below normal in 1997 with above-normal temperatures throughout the country since October 1997.

Thailand issued a special announcement 9 January 1998 forecasting drought conditions and warmer-than-normal temperatures in the coming dry season (January–May 1998) and calling for careful water management. Below-normal rainfall is forecast for January–February–March 1998 for Indonesia, the Philippines and the south-eastern tip of ***India***. Models indicate above-normal precipitation for northern India.[8]

Many coastal regions of ***New Zealand*** were flooded in December 1997. More than 100 millimetres of rain deluged the west coast of the South Island and left half of Greymouth submerged in water. On the other hand, drought conditions claimed large interior areas of New Zealand as El Niño continues to pose a real threat to the agricultural community. Crop and livestock losses from dry weather have been severe. Water is being rationed in some areas.[9]

December rainfall totals in tropical ***Australia*** were average to above average, reaching record high levels in southern parts of the Gulf of Carpentaria as a result of tropical cyclone Sid. Despite the continuing strong characteristics of the current El Niño event over the Pacific, there were some signs of a weakening influence of El Niño on Australia's weather in the tropical north. SSTs around tropical Australia are more than 1°C warmer than normal, thus providing a local source of moisture.

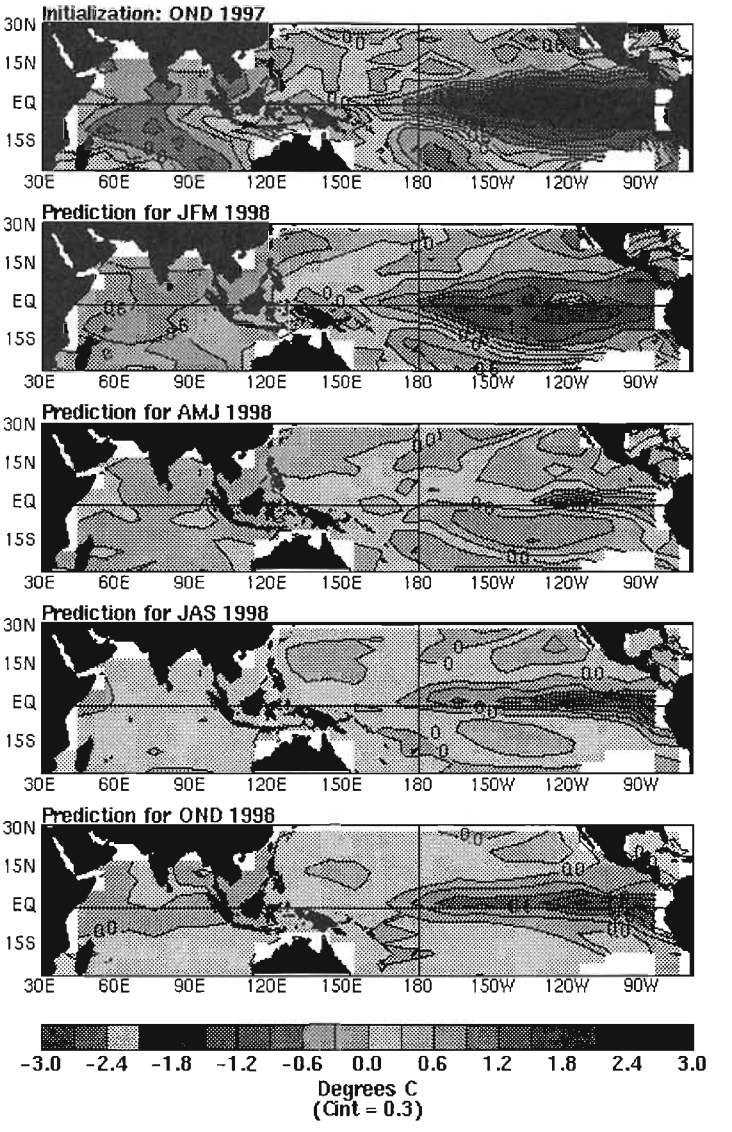

Figure 2 — Sea-surface temperature analysis for October–November–December 1997 and predictions for 1998 (http://www.cdc.noaa.gov/~mcp/Cecile.forecast.html)

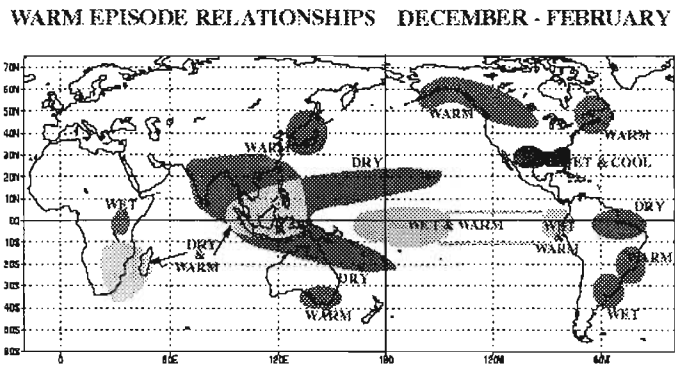

Figure 3 — Typical global impacts of temperature and precipitation associated with El Niño are illustrated

(http://nic.fb4.noaa.gov:80/products/analysis_monitoring/ensostuff/media/warm.gif)

Although recent trends in the climate pattern bode well for Australia's tropics, it is too early to say whether the pattern will persist. Based on statistics, a risk of drier-than-normal weather remains through much of Queensland as well as eastern and northern New South Wales. Elsewhere, however, the statistical guidance is inconclusive for this time of year. Residents of southern Australia should be aware of the continuing threat of high fire danger, particularly in dry areas of Victoria, southern NSW, southern Western Australia and eastern Tasmania.[10]

What are the impacts in South America?

In ***Pacific South America***, elevated SSTs in the eastern tropical Pacific enhanced thunderstorm activity across the coastal regions of ***Ecuador*** and northern ***Peru***. Heavy rains (70 to 110 mm) drenched Peru again as six-week moisture excesses ranged from 70 to 225 mm. Grave flooding occurred in Equador with precipitation 87 times the normal. Above-normal rains are forecast to continue in Peru and Equador for the period January–February–March 1998.

Across the ***central one-third of South America***, from the Andes eastward to the Atlantic Seaboard, an extensive warm air temperature anomaly characterized by temperatures of +3°C to +8°C above normal spread across upper southern ***Brazil***, most of ***Bolivia***, ***Paraguay*** and adjacent parts of northern ***Argentina*** in early January 1998. Torrential rains (100 to 240 mm) drenched most of the northern half of ***Uruguay*** and south-central Rio Grande do Sul state in Brazil. Six-week moisture excesses remained very high, with surpluses of 165 to 475 mm in Uruguay and 100 to 365 mm in southern Brazil, north-eastern Argentina and extreme southern Paraguay.[11]

Normal to above-normal precipitation is forecast in the coastal and wet plains region of ***Argentina*** through March 1998, although there may be some excesses in the coastal regions due to increased moisture transport from the Atlantic Ocean. High runoff from the Rio de la Plata river basin may occur due to excessive rainfall in the tropical region of ***Brazil***. A part of the resulting flow may feed the Amazon and São Francisco Basins.[12]

An ***Eastern South America*** Climate Forum was convened 19–21 January 1998 in Fortaleza, Brazil (*see* Sources) to create a consensus precipitation forecast for northern and north-eastern South America for the period February–March–April 1998. It concluded that all regions are likely to be drier than normal except the southern parts of north-east ***Brazil*** (Bahia) and the south-western coastal region of ***Colombia***. In particular, the northern parts of north-east Brazil (eastern Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba and Pernambuco and parts of northern Bahia) have particularly high probabilities of a drier-than-normal period.

Discussion in the Forum indicated that there were possible SSTs changes in the Atlantic Ocean. Should the ocean-atmosphere system alter significantly in the next three to four weeks, the El Niño induced drought conditions could be mitigated during the upcoming rainy season (March–April–May 1998) in northern north-east Brazil.

What are the impacts in southern Africa?

Drier-than-normal conditions are usually expected over southern Africa during El Niño events disrupting the rainy season which, for most of southern Africa, is from January through March. Exceptions are the northern and eastern part of Tanzania, and the far south-western part of South Africa.

A ***Southern Africa*** Climate Outlook Forum convened 18–19 December 1997 in Windhoek, Namibia, (*see* Sources) to formulate consensus guidance for January–February–March 1998 in Southern Africa. The forum was a mid-season meeting to update the information provided by an earlier Forum that convened in Kadoma, Zimbabwe on 8–12 September 1997.

Before the Tanzanian Long Rains, which usually start in March, above-normal rains are expected in northern and eastern ***Tanzania***. Near-normal rainfall is expected over the south-western half of Tanzania, northern and eastern ***Zambia***, central and northern ***Malawi*** and northern ***Mozambique***. Near-normal rainfall is expected also over north-western Zambia and the far north-western part of ***Namibia***. Over ***Mauritius*** and the south-western tip of ***South Africa***, near-normal to above-normal rainfall conditions are expected.

With southern Africa's rainy season halfway through, SST anomaly fields in the Indian and Atlantic Oceans, coupled with the regional atmospheric circulation trends, become more important in determining the rainfall prospects for the remainder of the rainy season across southern Africa.

Typically, during El Niño events, the south-west Indian Ocean becomes anomalously cool while the central and western Indian Ocean warms up. Cooler-than-normal south-west Indian Ocean SSTs generally strengthen the south-west Indian Ocean high-pressure system. This tends to prevent the main rainbearing systems from reaching southern Africa. Troughs rooted in the mid-latitude weather systems generally bypass the subregion, resulting in predominantly dry conditions south of about 10°S latitude.[13]

The south-west Indian Ocean showed signs of normalizing (warming up) from about the second week of December 1997 through the first week of January 1998. This helps to continue moderating the potential for adverse weather impacts of the current El Niño event across much of southern Africa.[14]

The chances of normal to above-normal rainfall remain good for ***Angola***, north-eastern ***Botswana***, northern ***Namibia***, ***Malawi***, northern ***Mozambique***, ***Tanzania***, north-western ***Zimbabwe***, ***Zambia*** as well as north-east ***South Africa*** and ***Swaziland.***[13, 14]

Over the interior of ***South Africa***, above-normal temperatures can be expected during the February–March–April 1998 period. Along the southern and western coast, near-normal to above-normal temperatures are expected. During May–June–July 1998, above-normal temperatures are expected over the country.

For February–March–April 1998, rainfall is expected to be near-normal (50 per cent probability) over the western part of the Western Cape. The north-eastern part of the country can expect near-normal to below-normal rainfall with 50 per cent probability of below-normal and 40 per cent probability of near-normal. Over the remainder of the summer rainfall regions below-normal rainfall can be expected (60 per cent probability).[15]

What are the impacts in Eastern and Central Africa?

Unrelenting rains that started in October 1997 continued in ***Kenya***, ***Uganda***, ***Somalia***, and parts of ***central Africa*** and the ***Ethiopian*** highlands. The observed ranges of precipitation by the end of December 1997 have been more than 5 to 10 times above the normal in some areas resulting in mass migration, and destruction of life and property. A section of the Nairobi–Mombasa highway was washed away as a result of excessive flooding. A landslide in Gucha District left 300 families homeless. Factories closed in Nairobi's Industrial Area due to El Niño floods. Scattered moderate to heavy rains also fell on Ethiopia and probably ***Tanzania***, where reliable data were lacking. Major flooding continued in southern ***Somalia*** along the Juba and Shabelle Rivers claiming an estimated 2 000 lives and forcing hundreds of thousands of inhabitants from their homes, while in eastern ***Kenya***, the swollen Tana River has left thousands homeless, disrupted transportation and caused extensive property damage. These rains are forecast to continue through March 1998.[16]

Notes

1. El Niño Update Number 1 (November 1997) and Update Number 2 (December 1997), WMO.
2. National Aeronautics and Space Administration (NASA), 8 January 1998.
3. WMO Press Release number 610, 20 January 1998, entitled "El Niño contributed to global warmth in 1997 according to WMO annual statement on the global climate".
4. National Oceanic and Atmospheric Administration (NOAA) Office of Global Programs (OGP), National Centers for Environmental Prediction (NCEP) and Climate Prediction Center (CPC), 12 January 1998.
5. NCEP Seasonal Advisory 97/4, 12 January 1998.
6. European Centre for Medium-Range Weather Forecasts (ECMWF), NCEP/CPC, 12 January 1998, Scripps Institution of Oceanography Experimental Climate Prediction Center, 5 January 1998, South African Seasonal Rainfall Advisory for Management 97/4 — Issued by the Long-term Operational Group Information Centre (LOGIC) and compiled by the Research Group for Seasonal Climate Studies (RGSCS), South African Weather Bureau (SAWB), Department of Environmental Affairs and Tourism, 22 December 1997.
7. NCEP/CPC, 12 January 1998.
8. Thai Meteorological Department, 16 January 1998, Meteorological Service Singapore, 18 November 1997, NCEP Climate Analysis Center (CAC) Global Climate Highlights, 10 January 1998, International Research Institute (IRI) for Climate Prediction, January 1998.
9. New Zealand National Institute of Water and Atmospheric Research, January 1998.
10. National Climate Centre, Bureau of Meteorology Australia, 5 January 1998.
11. NCEP CAC Global Climate Highlights, 10 January 1998.
12. Ecuador — Instituto Nacional de Meteorología e Hidrología, 26 December 1997.
13. NCEP African desk, 20 January 1998.
14. Drought Monitoring Centre (DMC) Harare, 10 January 1998.
15. South African Weather Bureau, 21 January 1998.
16. Environment Canada, January 1998, Kenya Meteorological Department, January 1998, NCEP CAC Global Climate Highlights, 10 January 1998.

Sources

In addition to sources already quoted, information has been drawn from two Climate Fora.

Eastern South America Climate Forum 19–21 January 1998, Fortaleza, Brazil:

Participants at the forum included representatives of Meteorological Services from Brazil, Colombia, French Guiana, Suriname, Venezuela and the USA. Participating institutions included the Instituto Nacional de Pesquisas Espaciais (INPE), the Fundacão Cearense de Meteorologia e Recursos Hídricos (FUNCEME), the Instituto Nacional de Meteorología (INMET), the Universidad Simon Bolivar, the Universidad Nacional de Colombia, NOAA OGP, IRI, WMO, and the Inter-American Institute for Global Change Research (IAI).

Southern Africa Regional Climate Outlook Forum, 18–19 December 1997, Windhoek, Namibia:

Participants at the forum included representatives of Meteorological Services from eleven SADC countries (Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe) and climate scientists and other experts from national, regional and international institutes (DMCs Harare and Nairobi; University of Zululand; Clark University, SADC Food Security Technical and Administrative Unit; Southern Africa Transport and Agricultural Organization; WMO; Food and Agriculture Organization; IRI; NOAA OGP; US Agency for International Development; the UK Meteorological Office; and IMGA/CNR-Bologna).

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