STATE OF THE CLIMATE IN 2008

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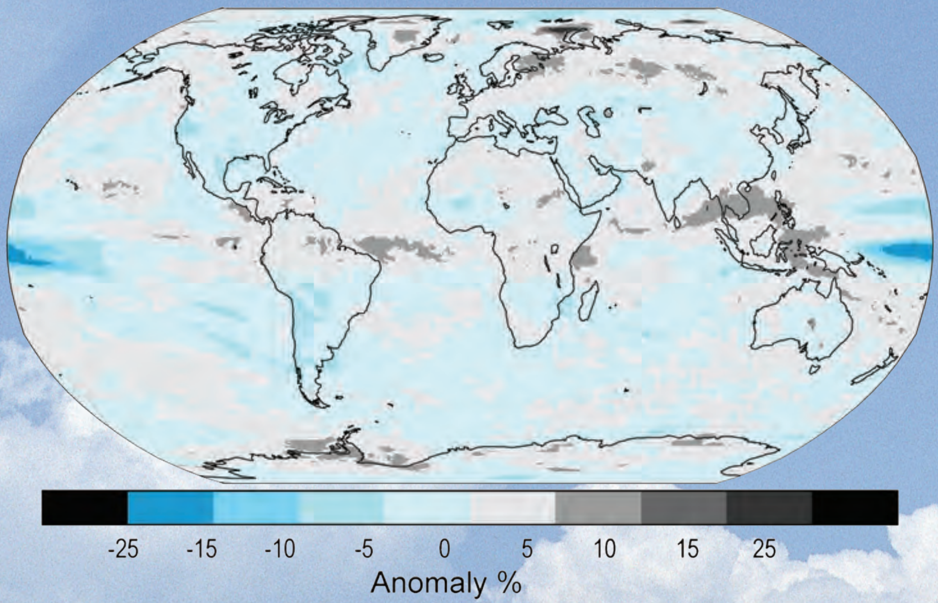
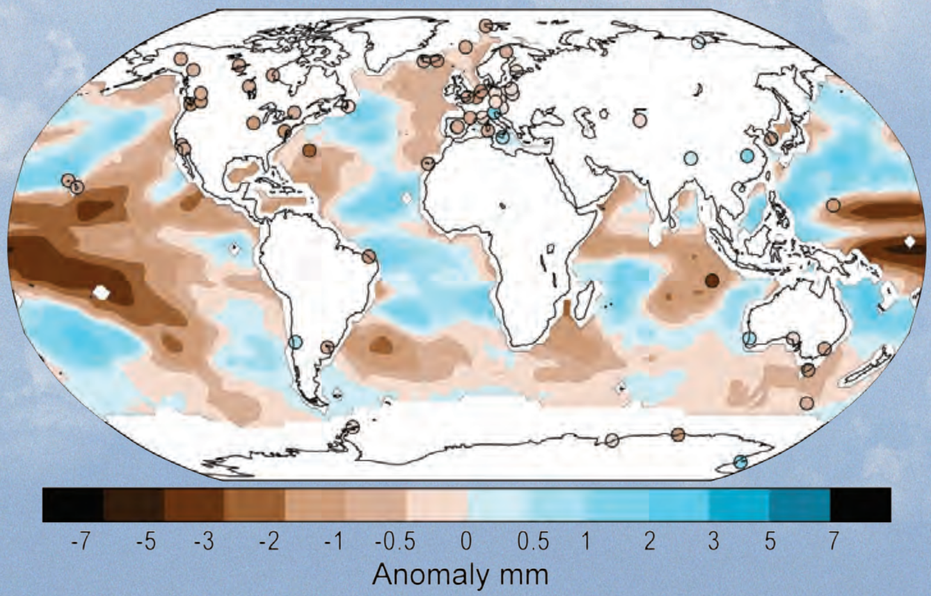
Cloud cover



Total column water vapor



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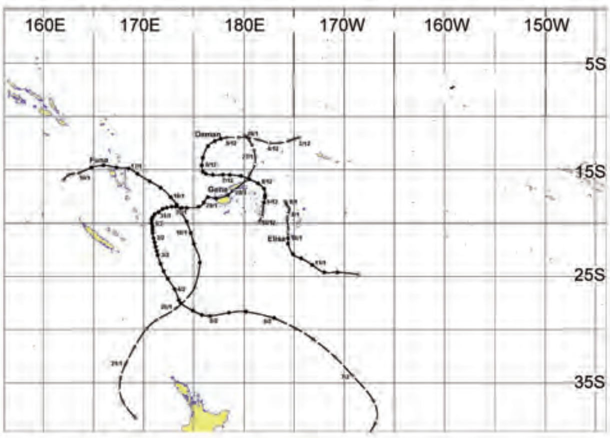

Fig. 4.24. TC tracks in the Southwest Pacific, 2007–08.

lages and causing widespread destruction to roads and property. TC Elisa formed on 10 January near the date line and moved southwest of Nukualofa, Tonga, producing maximum sustained winds of 45 kt. TC Funa developed near Fiji, then moved southeast toward Tonga 16–19 January with maximum sustained winds of 105 kt, causing heavy rain and storm-force winds to Vanuatu, which disrupted communications. TC Gene was the last of the 2007/08 winter season, developing northeast of Fiji and tracking toward New Caledonia. Maximum sustained winds were near 100 kt. This storm caused seven deaths on Fiji, left many without power, and caused estimated damages of $25 million (USD).

7) Australian basin—B. Trewin and A. B. Watkins

(i) Seasonal activity

The 2007–08 TC season was near normal in the broader Australian basin (areas south of the equator and between 90° and 160°E,[6] which includes Australian, PNG, and Indonesian areas of responsibility). The season produced 10 TCs, equal to the long-term average. There were three TCs in the eastern sector[7] of the Australian region during 2007–08, and seven TCs in the western sector. The number of landfalls was relatively low, with only two landfalls during the season.

(ii) Landfalling and other significant TCs

The most intense TC during the season was TC Pancho, which formed off the northwest coast on 25 March. It reached peak intensity (Category-4, 95-kt sustained winds with 135-kt gusts, 934-hPa central pressure; see www.bom.gov.au/weather/cyclone/faq/index.shtml for a definition of Australian TC categories) at 0000 UTC 27 March. It weakened below TC intensity before making landfall as a tropical low near Shark Bay on 29 March, bringing heavy rain to parts of southwestern Western Australia. An intense midlatitude low that absorbed the remnants of Pancho was responsible for widespread wind damage in Victoria and Tasmania on 2 April.

TC Nicholas was the sole landfalling TC in the western sector. It formed on 12 February and peaked as a Category-3 system (80-kt sustained winds with 115-kt gusts, central pressure 948 hPa) on 16–17 February. It eventually crossed the coast south of Coral Bay as a Category-1 system on 20 February. No significant damage was reported on land, but widespread shutdowns of the offshore oil and gas industry resulted in economic losses of several hundred million USD.

The other landfalling system of the season was TC Helen, which formed off the west coast of the top end of the Northern Territory and made landfall on 4 January about 100 km southwest of Darwin as a Category-2 system (50-kt sustained winds with 65-kt gusts, central pressure 975 hPa). There was some minor wind damage in the Darwin area. While Helen was short lived as a TC, long-lived remnants of the system moved into Queensland and contributed to major flooding in central Queensland in mid-January. Helen's track was also unusual, being the first landfall from the west on the top end coastline since Tracy in 1974–75.

TC Guba, which moved over waters east of Queensland from 14 to 20 November (2007) and peaked as a Category-3 system, was significant in that it approached the Queensland coast more closely than any other recorded November cyclone, although it did not ultimately make landfall. Guba's antecedent low caused severe flooding, with numerous deaths, in PNG on 12–13 November.

e. *Intertropical Convergence Zones*

1) Pacific—A. B. Mullan

There are two prominent convergence zones in the Pacific: the ITCZ in the Northern Hemisphere, which lies approximately parallel to the equator, with its position varying seasonally from around 5° to 7°N in February–May to 7° to 10°N in August–November

[6] The Australian Bureau of Meteorology's warning area overlaps both the SIO and SWP.

[7] The western sector covers areas between 90° and 125°E. The eastern sector covers areas east of the eastern Australian coast to 160°E, as well as the eastern half of the Gulf of Carpentaria. The northern sector covers areas from 125° E east to the western half of the Gulf of Carpentaria.

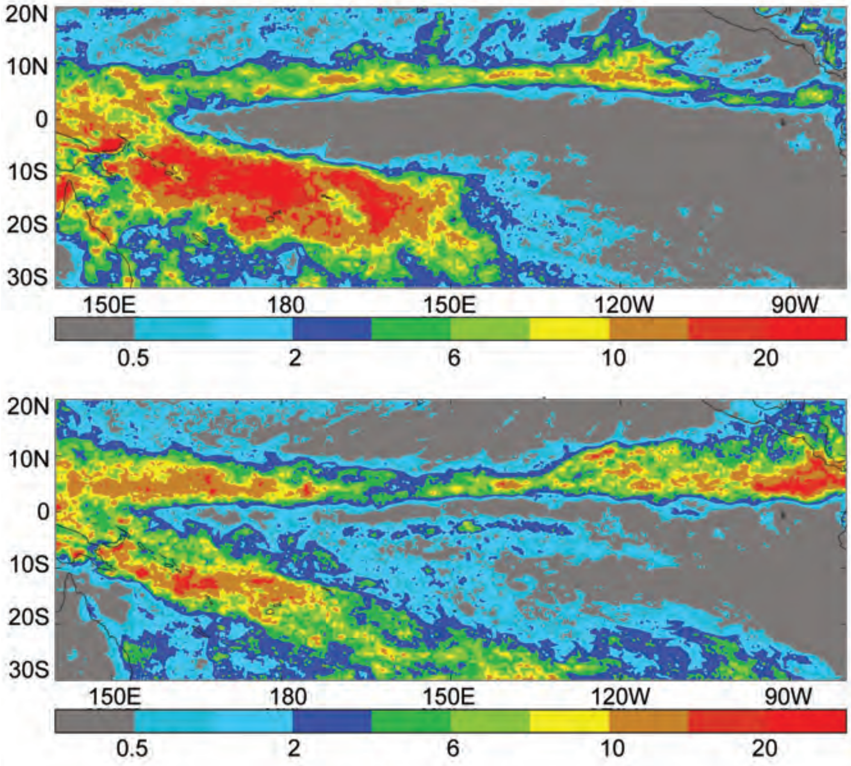

Fig. 4.25. Annual average rainfall rate from TRMM 0.25° analysis for (top) Jan 2008 and (bottom) May 2008. Note the uneven contour intervals (0.5, 1, 2, 4, 6, 8, 10, 15, and 20 mm day^{-1}).

(Fig. 4.27); and the SPCZ, which extends diagonally from around Solomon Islands (10°S, 160°E) to near 30°S, 140°W, and is most active in the November–April half-year.

Figure 4.25 shows the monthly rainfall in the tropical Pacific for two selected months in 2008, as derived from the 0.25° resolution NASA TRMM rainfall data (3B-43 product; Huffman et al. 2007). The year 2008 began with a continuation of strong to moderate La Niña conditions, and the January 2008 rainfall shows a clear separation between the ITCZ and SPCZ around the date line, with a region of suppressed convection extending from western to eastern Kiribati, which resulted in low rainfall in the northern Cooks and the Marquesas of French Polynesia. The SPCZ was well south and west of its normal position and very active through the first quarter of 2008 (Fig. 4.26, left), resulting in much-above-average rainfall in Vanuatu, New Caledonia, Tonga, Niue, and southern Cooks.

In May (Fig. 4.25, bottom), the SPCZ was still active and south of its normal position. A very clear southern branch of the ITCZ is apparent between 180° and 120°W, while the ITCZ in the Northern Hemisphere appears somewhat weaker than usual over the same longitudes. To the north of this section of the ITCZ, there is suppressed convection to at least 20°N, which was typical of the second quarter of 2008, contributing to the drought conditions that were declared in many parts of the Hawaiian Islands by midyear. The May rainfall also highlights a more intense ITCZ around 90°W. This continued into October, coinciding with several months of above-normal SSTs in the far eastern equatorial Pacific.

Unusually persistent trade winds dominated the weather across Micronesia and the equatorial South Pacific during the third quarter of 2008 (Pacific ENSO Applications Center 2008; Island Climate Update 2008b,c), and the ITCZ lay on the equatorward edge of its climatological distribution (Fig. 4.26, right). The SPCZ was fairly inactive in the third quarter, but convective activity increased in October and the SPCZ ended the year as it began—south of its normal position. The ITCZ spent much of the year, April through November (Figs. 4.26, right, 4.27), equatorward of its normal position, especially over the central Pacific (180° to 120°W).

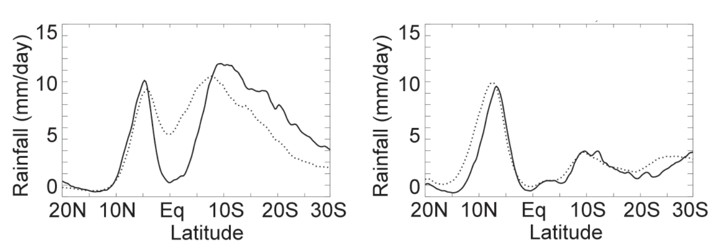

Fig. 4.26. Latitudinal cross-sections of TRMM rainfall (mm day^{-1}): Jan to Mar quarter averaged across the sector (left) 150°E–180°, and Jul to Sep quarter averaged across the sector (right) 180°–150°W. Profiles are given for 2008 (solid line) and the 1998–2007 average (dotted line).

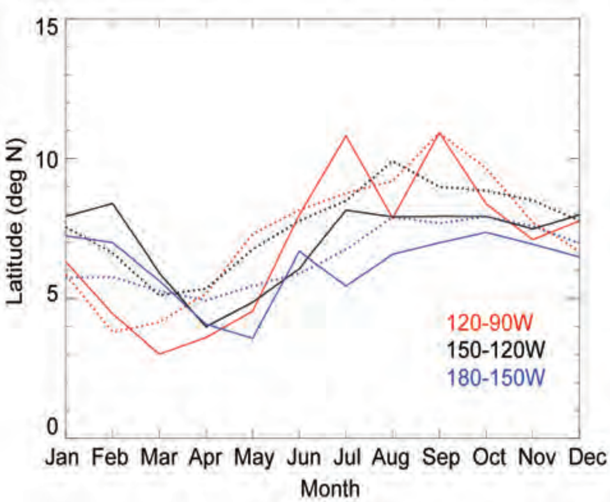

Fig. 4.27. Monthly variation in latitude of peak ITCZ rainfall over three longitude sectors: 180°–150°W (blue), 150°–120°W (black) and 120°–90°W (red). Annual cycle variations given for 2008 (solid lines) and the 1998–2007 climatology (dotted).

2) Atlantic—A. B. Pezza and C. A. S. Coelho

The Atlantic ITCZ is a well-organized convective band that oscillates approximately between 5° and 12°N during July–November and 5°N and 5°S during January–May (Waliser and Gautier 1993; Nobre and Shukla 1996). As equatorial Kelvin waves can modulate the ITCZ's interannual variability, ENSO is also known to influence it on a seasonal scale (Münnich and Neelin 2005).

In the semiarid area of northeastern Brazil a sudden southward burst of the Atlantic ITCZ can produce heavy rains (monthly anomalies above 300 mm) as observed in March 2008 (Fig. 4.28). This pattern is facilitated during La Niña and when the South Atlantic is predominantly warmer than the North Atlantic Ocean, as observed in the first half of 2008.

The Atlantic ITCZ reached its southernmost annual position (5°S) during the second half of March in 2008 (Fig. 4.29a). This positioning is within the climatological range (Waliser and Gautier 1993). The ITCZ then migrated rapidly back to the North Atlantic from May (Fig. 4.29b), reaching its northernmost position (10°–15°N) during late August in association with intense convective activity near the African coast (Fig. 4.29c). The resulting convective band during the boreal summer was aligned from southwest–northeast over the North Atlantic (Fig. 4.29c), different from the quasihorizontal alignment observed in May (Fig. 4.29b). This pattern was modulated by strong low-level wind anomalies demarcating the mass convergence between South America and Africa, and further reinforced by a semistationary upper-level vortex over the South Atlantic near northeastern Brazil in August.

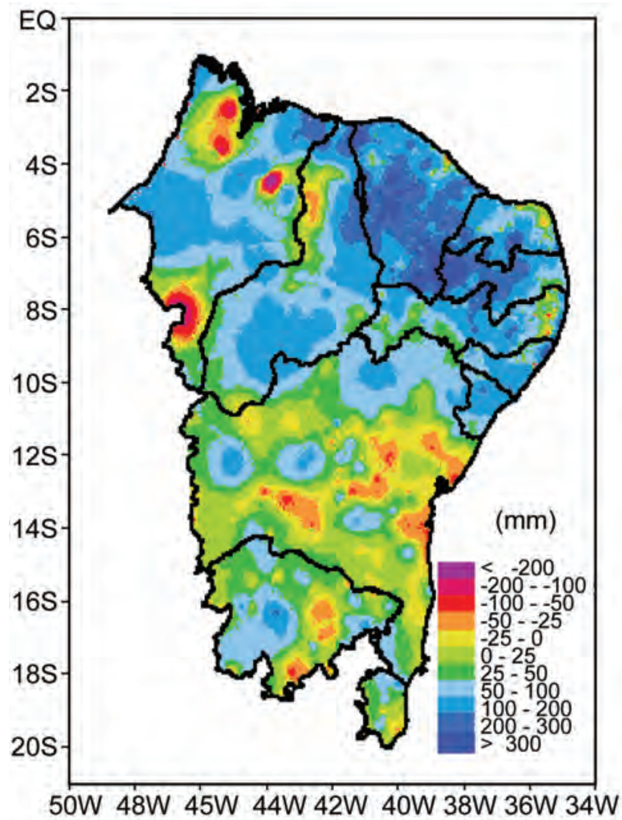

Fig. 4.28. Northeastern Brazil Mar 2008 precipitation anomalies (mm) with respect to 1961–90 climatology based on high-resolution station data.

For the remainder of the year the Atlantic ITCZ was close to its climatological average, slowly returning to the south and reaching 5°S in December. As a result, a large area of the tropical South Atlantic recorded above-average rainfall in 2008 compared to the 1998–2007 annual mean (Fig. 4.30), contrasting with the below-normal conditions observed in 2006 and 2007.

f. Indian Ocean Dipole—J. J. Luo

The IOD is a coupled ocean–atmosphere phenomenon in the tropical IO. Following a weak negative IOD in 2005, three consecutive positive IODs occurred from 2006 to 2008 (Fig. 4.31a). The SSTs have warmed persistently (Fig. 4.31b) in the central equatorial IO. In contrast, SSTs along the west coast of Sumatra have not increased and are slightly cooler. This indicates the impact of frequent positive IOD on the long-term climatological SST state. The trends of warmer SST in the central and western IO and relatively colder SST west of Sumatra may favor the occurrence of positive IOD.