

STATE OF THE CLIMATE IN 2005

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ABSTRACT—K. A. Shein⁸²

The State of the Climate 2005 report summarizes global and regional climate conditions and places them, where possible, into the context of historical records. Descriptions and analyses of notable climatic anomalies, both global and regional, also are presented.

According to the Smith and Reynolds global land and ocean surface temperature dataset in use at the NOAA National Climatic Data Center (NCDC), the globally averaged annual mean surface temperature in 2005 was the warmest since the inception of consistent temperature observations in 1880. Unlike the previous record positive anomaly of 1998 (+0.50°C), the 2005 global anomaly of 0.53°C above the 1961–90 mean occurred in the absence of a strong El Niño signal. The record ranking of 2005 was corroborated by a dataset maintained at NASA, while United Kingdom archives placed 2005 second behind 1998. However, statistically, the 2005 global temperature anomaly could not be differentiated from either 1998 or any of the past four years. The majority of the top 10 warmest years on record have occurred in the past decade, and 2005 continues a marked upward trend in globally averaged temperature since the mid-1970s. Lower-tropospheric temperature was the second warmest on record, with northern polar regions the warmest at 1.3°C above the 1979–98 mean.

Unlike air temperatures, globally averaged precipitation was near normal relative to the 1961–90 period mean value. The global 2005 anomaly was just –0.87 mm. Over the past 25 years, only 7 years have had above-normal precipitation. Additionally, in 2005, only September–November experienced a positive anomaly. Northern

Hemisphere snow cover extent was 0.9 million km² below the 36-year average (fifth lowest) and Arctic sea ice extent was record lowest in all months of 2005 except May, resulting in a record lowest annual average Arctic sea ice extent for the year and continuing a roughly 8% yr⁻¹ decline in ice extent.

Carbon dioxide (CO₂) concentrations rose to a global average of 378.9 parts per million (ppm); about 2 ppm over the value from 2004. This record CO₂ concentration in 2005 continues a trend toward increased atmospheric CO₂ since the preindustrial era values of around 280 ppm. The globally averaged methane (CH₄) concentration in 2005 was 1774.8 parts per billion (ppb), or 2.8 ppb less than in 2004. Stratospheric ozone over Antarctica reached a minimum of 110 Dobson units (DU) on 29 September. This represented the 10th lowest minimum level in the 20 years of measurement of stratospheric ozone.

In the global ocean, sea level was above the 1993–2001 base period mean and rose at a rate of 2.9 ± 0.4 mm yr⁻¹. The largest positive anomalies were in the Tropics and Southern Hemisphere. Globally averaged sea surface temperature (SST) also was above normal in 2005 (relative to the 1971–2002 mean), reflecting the general warming trend in SST observed since 1971. In the Tropics, only a weak warm phase of El Niño materialized, but dissipated by March. A relatively active Madden–Julian oscillation (MJO) resulted in the disruption of normal convective patterns in the tropical Pacific and generated several Kelvin waves in the oceanic mixed layer.

In the Atlantic Ocean basin, there was record tropical storm activity, with 27* named storms (15 hurricanes).

Three became category 5 storms on the Saffir–Simpson scale, and Hurricane Wilma set a new record for the lowest pressure (882 hPa) recorded in the basin. Both Hurricanes Stan and Katrina had exceptional death tolls, and Katrina became the costliest storm on record. Below-normal tropical storm activity in several other basins resulted in near-normal conditions globally in 2005.

Regionally, annual and monthly averaged temperatures were above normal across most of the world. Australia experienced its warmest year on record, as well as its hottest April. For both Russia and Mexico 2005 was the second warmest year on record.

Intermittent and delayed monsoons in Africa and East Asia resulted in below-normal precipitation in many areas. Drought continued in much of the Greater Horn of Africa and developed in the central United States. Record severe drought occurred over both the Iberian Peninsula and western Amazonia in 2005. In the Amazon, river levels dropped by as much as 11 m between May and September. Conversely, heavy snows early in 2005 combined with a warm boreal spring to generate widespread flooding in areas of southwest Asia. Canada experienced its wettest year on record in 2005, with flooding in Alberta, Manitoba, and Ontario. In July, the South Asian monsoon delivered a record 944.2 mm of precipitation over 24 h to areas around Mumbai, India.

* Tropical cyclone counts in this report do not reflect the 10 April 2006 identification, by the NOAA National Hurricane Center, of a 28th (Subtropical) storm in the Atlantic basin. Please visit www.nhc.noaa.gov for further information.