trend in the size of wildfires (Westerling et al. 2006), with 6 of the 10 worst seasons in terms of acres burned having occurred since 2000.

Wildfire activity started earlier than usual in 2007, as wildfires affected portions of the Tennessee Valley and the Southeast in March, eventually spreading to northern Minnesota in April and southern Florida in May. In the West, the fire season started slowly in June, except in central California, where numerous blazes affected the Lake Tahoe area. Fire activity increased dramatically in July, as large portions of the Intermountain West were affected by wildfires. The most severe fire activity during the summer occurred in the northern Rockies, where numerous large fires burned in July and August. Fire activity persisted into September across Idaho and Montana, but eventually shifted southward into

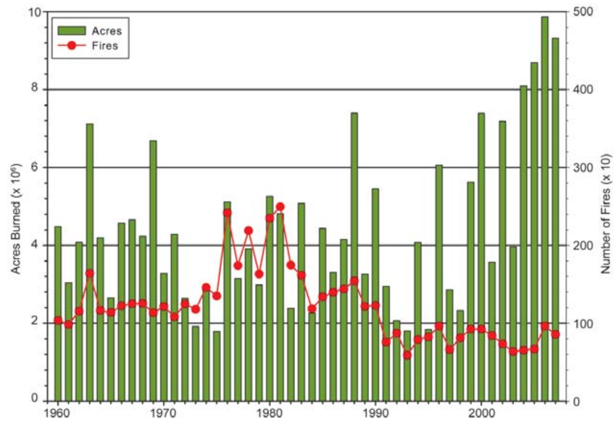

Fig. 6.14. The annual number of wildland fires (curve, right axis) and acres burned (bars, left axis) for the contiguous United States for 1960–2007.

DIAGNOSIS OF CAUSE(S) FOR 2007 U.S. PRECIPITATION EXTREMES—M. P. HOERLING IN CONJUNCTION WITH THE NOAA CSI TEAM

For the contiguous United States, large precipitation deficits occurred in the Southwest and Southeast regions during all seasons in 2007, with annual departures exceeding –30% of the 1971–2000 climatologies (Fig. 6.15, top). The concurrent oceanic conditions consisted of a lingering El Niño during winter/early spring 2007 followed by a La Niña event in late summer and fall of 2007. Three different atmospheric climate models were used to assess whether such dryness was related to global SST conditions. The models (NCEP GFS, NCAR CCM3, and GFDL AM2.1, with nominal resolution of ~200 km) were forced with the monthly varying global 2007 SSTs. For these so-called GOGA runs, 50 separate realizations were conducted for each model. The multimodel ensemble mean precipitation anomaly (percent of climatology), computed relative to control simulations that had used climatological global SSTs of 1971–2000, consists of a dry signal over much of the southern United States (Fig. 6.15, middle).

In a further suite of runs, SSTs were specified over the region 20°N–20°S, 160°E to the South American coast only (i.e. the ENSO domain), while climatological SSTs were specified elsewhere over the world's oceans. For these so-called EPOGA runs, 50 separate realizations were again conducted for each model. A strong wet signal occurs over the Southwest (Fig. 6.15, bottom left), opposite of the observed drought conditions. The simulated wet signal is especially strong during winter/spring 2007 when El Niño conditions prevailed, and is also consistent with historical observations that reveal ENSO impacts to be largest during that time of year (Kiladis and Diaz 1989). It is evident, however, that the expected wet signal failed to emerge during 2007; both the empirically derived wet signal expected from historical ENSO impacts, and the simulated signal from these EPOGA simulations are opposite to the observed drought conditions. It thus appears that ENSO was not a critical factor with respect to the droughts of 2007.

The principal anomalies in global SSTs during 2007, outside the ENSO region, were characterized by warmth in the tropical Indian and Atlantic Oceans, and warmth across much of the extratropical North Pacific and North Atlantic Oceans (see section 3). The effect of the "non-ENSO region" SST forcing was estimated by constructing the differences "GOGA-EPOGA" (subsequently referred to as global/non-ENSO). To the extent that the U.S. response can be viewed as the simple linear superposition of various ocean-forced signals, this analysis is one estimate for the SST-forced signal from the ocean conditions outside of the tropical eastern Pacific. The global/non-ENSO results (Fig. 6.15, bottom right) reveal a strong U.S. precipitation sensitivity to this non-ENSO region forcing. In particular, a dry signal occurs along the entire southern tier of states, having a maximum percentage reduction in precipitation over the Southwest akin to the observed anomalies. Over the United States as a whole, this dry signal overwhelms the east Pacific induced wet signal. Thus, the modest U.S. drying emerging in response to the full global SST conditions of 2007 (Fig. 6.15, middle) reflects the cancellation between two mutually exclusive SST influences—a wet ENSO effect and a stronger drying effect due to non-ENSO SST conditions.

The preliminary diagnosis presented above provides some attribution of key features of the observed 2007 U.S. climate conditions. The text uses subjective language to interpret the likelihood that certain conditions were caused by certain forcings, but at this point that should be viewed as a *qualitative*, expert assessment. Regarding the anomalously low precipitation within

California later in the month. The most destructive fires of the year occurred in Southern California during the fall, as severe-to-exceptional drought and strong Santa Ana winds exacerbated brush and forest fires, destroying homes across the region in October and November.

The 2007 fire season was not an especially severe one in Alaska, which had just over half a million acres (~202,000 hectares) burned during the year. However, in September the Anaktuvuk River wildfire, which was caused by lightning, burned over 250,000 acres (~100,000 hectares) and set a record for the largest fire on Alaska's North Slope.

(vi) Severe extratropical storms

Several severe extratropical cyclones affected the United States in 2007. The first major system moved across parts of the Midwest and the Northeast on 13–15 February. The intense storm produced significant accumulations of ice and snow in these areas, with some locales in Illinois receiving more than 30 cm of snow. In upstate New York more than 100 cm of snow was reported. During 15–17 April, a nor'easter moved up the eastern seaboard, bringing strong winds, high seas, and heavy rains from South Carolina to Maine. Some locations across the Northeast received over 190 mm of rain in a single day, producing widespread flooding, while on the cold side of the storm, more than 40 cm of snow fell across Vermont and New Hampshire.

During the normal spring peak in severe weather, several tornado outbreaks occurred across the plains, producing over 400 tornadoes during April and May combined. The worst of these outbreaks occurred

the two drought regions, this diagnosis suggests the following main conclusion:

The droughts were inconsistent with east tropical Pacific SST variability during 2007, and thus were unlikely caused by the ENSO cycle occurring during January–December 2007. We estimate less than a 5% probability that the observed droughts were consistent with climate conditions driven from the tropical east Pacific in 2007.

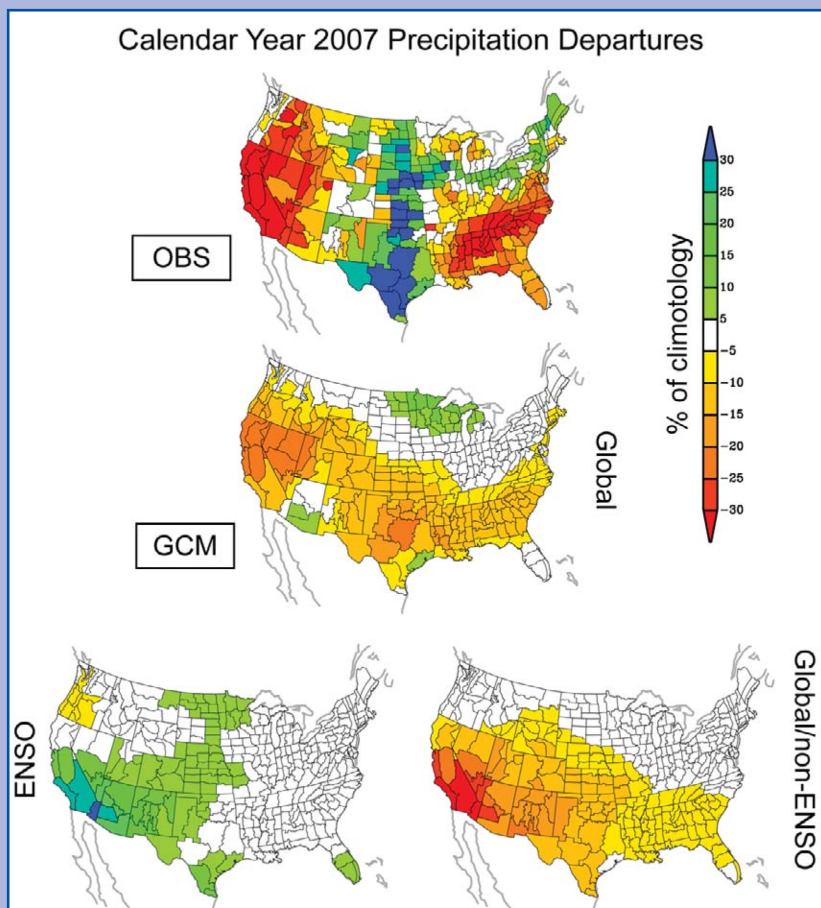

Fig. 6.15. The U.S. 2007 annually averaged (Jan–Dec) precipitation departures expressed as a percentage of the 1971–2000 climatologies for (top) observations (OBS), for (middle) simulations based on global SST forcing (contour interval half as for OBS), (bottom left) for simulations based on tropical east Pacific SST forcing (same contour interval as for OBS), and (bottom right) for simulations based on global SST forcing excluding the tropical east Pacific (global/non-ENSO; same contour interval as for OBS). [Source: NOAA CSI Team.]