Los Angeles fires seen from space

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Hundreds of fires were set in Los Angeles following the verdict of Rodney G. King vs. the Los Angeles Police Department on 29 April 1992. These fires were of sufficient intensity and extent to be imaged at \(\approx 1\) km resolution by the Advanced Very High Resolution Radiometer (AVHRR) aboard the polar orbiting satellites operated by the National Oceanic and Atmospheric Administration (NOAA) (the reader is referred to VanWoert et al., [1992], for an overview of the characteristics of the AVHRR instrument). We present here a thermal infrared image taken the first night of the riots, compare it with an image taken several years earlier but typical of this area, and discuss the relationships with the land cover observed in a 20-m resolution image from the French satellite SPOT (Systeme Probatoire pour l’Observation de la Terre).

The 3.7\(\mu\)m thermal infrared image taken on 30 April 1992 at 03:47 PDT (approximately 10 hours after the start of the riots) is shown in Fig. a. An exceptionally large thermal anomaly, extending over more than 85km\(^2\) and saturating at 48.6 C on a few pixels, is seen near the center of the image (the warm sector at the bottom left is the ocean, which is warmer than the land at night). This thermal anomaly corresponds to South Central Los Angeles, where an average of three new fires were started each minute during the three hours preceding the image (Washington Post, 1 May 1992).

In contrast, surface temperature is fairly uniform in thermal infrared images taken under normal conditions. Fig. b shows an image from a series taken in August 1984 and 1985. Slight increases of \(\approx 2\) C are seen over the industrial zone of El Segundo near the coast, and over downtown Los Angeles, a so-called "urban heat island" related to the lower moisture availability of the soil in these areas [Oke, 1978]. The positions of these thermal anomalies with respect to urban features are illustrated in the SPOT image (Fig. 1c). Land covers were classified using the green and near-infrared channels, which best discriminate between built areas and vegetation [Dousset, 1991]. Major boulevards and avenues (for example, Wilshire, Pico, Manchester) are revealed by industrial/commercial buildings bordering them, coded in red. Interstate highways (such as I-10, I-405), which are not bordered by constructions, are barely visible. Residential blocks, identified by their vegetation, are coded in blue. Irrigated golf courses, such as the L.A. Country Club on Wilshire blvd. and the Hillcrest Country Club on Pico Blvd., are coded in green. The low vegetation area of downtown Los Angeles is seen as the large red patch in the northeast of the image. Other low vegetation areas are the industrial zone of El Segundo and LAX airport near the ocean. The boundaries of these low vegetation areas correspond closely to the urban heat islands seen in Fig. b. The large thermal anomaly seen in Fig. a, however, is located southwest of downtown Los Angeles, an area which is cooler under normal conditions.

The temperature variations are best quantified in the north to south section shown in Fig. 2. For the "normal" image (bottom panel), the brightness temperatures are fairly uniform in the 3.7\(\mu\)m and 10.8\(\mu\)m channels, with a slight increase from 13 C to 15 C as the section grazes the heat island of downtown Los Angeles at km 10. For the image taken on the night of the fire (central panel), the variations of brightness temperatures in the 10.8\(\mu\)m and 12.0\(\mu\)m channels mimic those seen in