Chapter Seven

The Violent Sun

LONDON, THE HOUSES OF PARLIAMENT: SUN BREAKING THROUGH THE FOG The French painter Claude Monet (1840–1926) wrote that he dreamed of painting the Sun "setting in an enormous ball of fire behind the Parliament", but the Sun's movement and changing appearance in the dreary London weather made this difficult. Instead, Monet used diffuse orange and reddish hues to capture the effect of sunset in a dense, foggy atmosphere, flattening the massive, neo-Gothic building to a dark silhouette of towers and pinnacles. (Courtesy of the Musée d'Orsay, Paris. Photograph: Musées Nationaux, Paris.)

7.1 ENERGETIC SOLAR ACTIVITY

Without warning, the relatively calm solar atmosphere can be torn asunder by sudden, catastrophic outbursts of incredible energy. These transient brightenings, called solar flares, flood the Solar System with intense radiation from X-rays and extreme-ultraviolet radiation to radio waves. The powerful flares are easily observed at these invisible wavelengths, where they can briefly dominate the Sun's output and sometimes outshine all other astronomical sources (Fig. 7.1).

FIG. 7.1 Extreme ultraviolet flare An explosion on the Sun sends material out 150 thousand kilometers from the visible edge of the Sun. The emitting gas shines in the extreme ultraviolet emission from hydrogen atoms at 12.16 nanometers, called the Lyman alpha transition. This image shows that the radiation is emitted from numerous long, thin magnetic filaments. It was taken from the *Transition Region And Coronal Explorer,* abbreviated *TRACE.* (Courtesy of the *TRACE* consortium and NASA; *TRACE* is a mission of the Stanford-Lockheed Institute for Space Research, a joint program of the Lockheed-Martin Solar and Astrophysics Laboratory, or LMSAL for short, and Stanford's Solar Observatories Group.)