Volcano occurrence over a large area (Figure 1) and provides a constant viewing geometry, making it easier to carry out automated image co-registration and production of time-lapse movie loops. A major benefit of GOES data is its high temporal resolution. In routine operating mode the GOES imager scans the latitudes of the United States once every 15 minutes, and South America once every 30 minutes. Once every 3 hours the imager takes 30 minutes to scan the full Earth disc. This allows coverage of volcanoes across the North American continent 3-4 times an hour, as at Kilauea during June 1998 (Table 2; Figure 4a). Although targets in the southern hemisphere have lower data frequencies, during June 1998 images for Lascar were still available once or twice an hour (Table 2; Figure 4b). During severe weather a warning mode scans the U.S. latitudes 8 times an hour [Menzel and Pardom, 1994], this meant that during June 1998 volcanoes such as Popocatepetl, Montserrat, Santa Maria, and Pacaya could be covered up to 8 times an hour (Table 2; Figure 4c-f).

The geostationary orbit has two limitations [Mougis-Mark and Dommegue-Schmidt, this volume]. First, the fixed field of view means that 5 satellites are needed to provide global coverage. Currently the 2 GOES satellites, located at 135°W and 75°W (Figure 1), are the only geostationary satellites with the mid-infrared band critical for hot spot monitoring (Table 1). Second, there is extreme image distortion beyond ~50° from the sub-spacecraft point. Consequently, polar-orbiting sensors such as the AVHRR are an attractive option for global coverage, but geostationary satellites, such as GOES, represent the best high temporal resolution monitoring option for targets within their footprint.

Harris et al. [1997a] showed how, despite coarse (4-km-pixel) spatial resolution, the GOES 3.9-μm (3.78-4.03 μm) and 10.7-μm (10.2-11.2 μm) bands could be used to detect and chronicle effusive volcanic eruptions with a 15-minute temporal resolution. As with the AVHRR, the sensitivity of measurements in the mid-infrared portion of the spectrum to sub-pixel hot spots makes the GOES 3.9-μm band particularly useful for hot spot detection. The potential of GOES for hot spot monitoring indicated by this initial study led to the creation of a web-based monitoring tool which makes GOES-derived volcanic hot spot information available at http://goes.pgd.hawaii.edu/goes/ within minutes.

Figure 2. Hot spot occurrence on AVHRR images of the north Pacific region received at the Alaska Fairbanks receiving station 1996-1998. For each volcano, solid circles indicate 10-day periods during which a hot spot was evident on at least one AVHRR image. Black lines give persistent hot spot periods.