The volcanoes of the Aleutian Peninsula

The Aleutian Island Arc consists of 26 volcanoes which have been active since the beginning of the 20th century (Schafer et al. 2009), and many other dormant volcanoes. They have formed as a result of the increscent drive of the oceanic Pacific Plate northward, forcing its subduction beneath the continental North American Plate. The remote location of the Aleutian Island volcanoes, and largely inhospitable climate, means they are not always amenable to ground-based monitoring, rendering their remote monitoring as preferable. This remote monitoring is largely conducted by the Alaska Volcano Observatory (AVO), based in Fairbanks, Alaska. The AVO is a joint program between the USGS, the Geophysical Institute of the University of Alaska Fairbanks and the State of Alaska Division of Geological and Geophysical Surveys.

Monitoring Thermal Activity

Volcanoes, by their very nature, emit radiant thermal energy which is often indicative of the precise activity occurring at and below the surface. Given that many satellites have been endowed with sensors sensitive to thermal radiation, such satellites are of great utility for monitoring volcanic activity remotely (Harris et al. 1997; Dehn et al. 2000; Hirn et al. 2008). This utility comes into its own when monitoring volcanoes as remote as those of the Aleutian Island Arc.

Satellites endowed with thermal detection capabilities include the NASA Sensors:ASTER (the Advanced Spaceborne Thermal Emission and Reflection Radiometer) and MODIS (the Moderate Resolution Imaging Spectroradiometer) on-board the EOS Aqua and Terra platforms. The NOAA AVHRR satellites also possess such capabilities and have some distinct advantages over other sensors, including a data archive effectively extending back to the late 1970s and the availability of multiple images per day. With regard to AVHRR observations of active volcanoes, the record is extensive and in fact, AVHRR has been termed a workhorse in the monitoring of volcanic thermal anomalies (Bailey et al. 2010). Such data are monitored in real-time at the AVO and, following processing, can be viewed for all Aleutian (and Kamchatkan) volcanoes at AVO (2012). AVHRR data are additionally used at the AVO for monitoring ash cloud emissions (Webley et al. 2009).

Example output of the Alaska Volcano Observatory’s web-based interface (AVO, 2012). Here, Augustine Volcano is shown during its 2006 eruptive phase (from Blackett, 2012). The interface, termed 'Hotspot Viewer', consists of 40 pixel x 40 pixel view of the region roughly centred on the active volcano. Thermal emissions from the volcanic surface, and from the plume, are emitted.

To put these volcanic emissions in context, the total of daily power emissions from these Aleutian volcanoes since 1993 (138.31 GW) is slightly more than the sum nuclear power generated by the EU in 2007 (Eurelectric, 2012).

Acknowledgements: Research conducted using fund applied for an Applied Fellowship from Coventry University’s Faculty of Business Environment and Society. Gratitude is expressed to the hosts of this Fellowship: the AVO.