outward radial movement 2005-6 exceeds the inward contraction 2004-5, by a factor of about 3 on average. Comparing outward movement 2003-4 with 2005-6, the two patterns are very similar in terms of vector direction and amount. The most notable difference is that the western stations appear to have moved less in 2005-6 than in 2003-4, whereas in the lower northeastern flanks the opposite is the case.

Interpretation to date

It seems likely that a combination of both inflation of a magma storage area and outward gravitational spreading are responsible for the movement 2005-6. In view of the flank eruption that began 3 days after the survey was completed, it is probable that the volcano was inflated, but on the other hand, the similarity in flank vectors 2003-4 and 2005-6 suggests that this inflation is superimposed upon a fairly constant rate of spreading.

Conclusions and recommendations

The ground deformation of large volcanoes with steep slopes and large topographic differences can only really be studied by the use of dual-frequency GPS and other precise ground surveying techniques. The method of satellite radar interferometry, which showed such promise in the 1990s, and is still an extremely useful tool for volcanoes of low relief (such as some Hawaiian and Icelandic volcanoes), is subject to systematic topographic and unknown atmospheric errors. In addition, vegetation causes incoherence so that many areas of the volcano are inaccessible to this technique, which in any case can only yield movement in the ground-satellite vector, so that horizontal and vertical movement is indistinguishable.

Whilst rapid kinematic GPS surveys are useful during an eruption or when large movements are taking place in small areas, the small movements shown over a long period within such a large network as this require a well-coordinated campaign of multiple static observations.

Publications

Murray, J.B. & Pitty, A.R. Intrinsic and extrinsic influences on deformation and eruptive activity at Mt Etna volcano, Sicily. *Bull. Volc.* In preparation. This paper lays out the evidence for 3 different influences: magmatic, gravitational and regional, on the recent eruptions at Etna.

Murray, J.B. The ground deformation technique as a detection tool for intruded dykes on an active volcano: the case of Mt Etna, Sicily. *J.Volcanol & Geotherm Res.* In preparation. A short paper highlighting inter-technique discrepancies in accounts of dyke intrusions from seismic data alone.