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## The Arusha National Park, northern Tanzania: geotourism and volcanology of Mount Meru

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Despite its small size, the Arusha National Park is one of the most spectacular in East Africa. The main feature is Mount Meru (4,562 m), a huge stratovolcano with a diameter of 25 km, that rises some 3,000 m above the plateau, to the north of the regional town of Arusha. A highlight for geotourism is a four day trek to the summit with overnights at the Miriakamba and Machame huts. The higher slopes are devoid of vegetation, whereas the lower slopes and parts of the caldera floor are thickly forested. Views of the snow-clad peaks of Kilimanjaro are an additional reward. Most landforms in the park are ascribed to volcanic processes within relatively recent times. The volcano includes a rocky summit ridge, a giant horseshoe-shaped caldera that contains a pyramidal ash cone, and undulating topography on the lower eastern slopes, related to catastrophic debris avalanche flows. The ash cone last erupted in 1910 and, since then, there has only been minor evidence of fumaroles. Meru should be monitored as a potential hazard.



*Ash Cone at Meru, within the giant caldera (left), and rocky summit ridge with Socialist Peak (right)*

The volcano is built upon an older, faulted, volcanic terrain (lava flows west of the mountain have been dated at 3.1-2.4 Ma), part of the extensive Neogene volcanism that characterizes plateaus east of the Gregory Rift in northern Tanzania. Meru is related to the younger, Upper Pleistocene-Holocene volcanism. The subsidiary peak of Little Meru (0.40-0.30 Ma), the oldest feature at Meru, is dominated by explosive nephelinite breccias that contain clasts of phonolite. The main cone was built up to a height of possibly over 5,000 m between 0.20 Ma and 0.08 Ma, a time when volcanism at Kibo, the youngest component of Kilimanjaro, was waning. The cone is dominated by breccias and tephra resulting from

explosive, Plinian-style eruptions. Around 0.06 Ma a new burst of activity resulted in formation of the Summit Group, a capping of phonolite and nephelinite lavas that form Socialist Peak, a 150 m-high rock dome. The cone collapsed and partially disintegrated around 7,800-7,000 BP, to produce a horseshoe-shaped caldera some 8 km in length, 5 km in width, and with 1,300 m-high internal walls. The caldera formed from a style of collapse to that witnessed at Mount St. Helens, and produced giant debris avalanche deposits (DADs) on the lower eastern slopes. The Momella Lahar (or DAD) has a surface area of 400 km<sup>2</sup> and a volume of 28 km<sup>3</sup> (having travelled almost 35 km) and created small lakes (stopovers for migrating birds) that fill hollows in the plateau. The giant cone of ash and scoria that rises some 1,067 m above the caldera floor is ascribed to the waning phase of the volcanism at Meru.

*References:*

[1] Wilkinson P et al. (1986) *Journal of the Geological Society of London*, 143: 601-605.

