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Geometric and kinematic features of the dike complex at Mt. Somma, Vesuvio (Italy)

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Dikes provide important information on the structure, state of stress and activity of a volcano. Mt. Somma borders part of the Vesuvio cone (Italy), displaying ∼100 dikes emplaced between ∼18-30 Ka. Field, AMS (Anisotropy of Magnetic Susceptibility) and thin section analyses are used to characterize their geometry and kinematics (direction and sense of flow). The dikes mostly have a NNW-SSE to NE-SW strike. Approximately 57% are radial to the older Somma edifice, ∼27% are oblique and ∼16% tangential. Among the latter two groups, ∼32% are outward dipping and ∼11% inward dipping. The dike thickness varies between 0.2-3 m, with a mean value of 1.17 m. The kinematics of 19 dikes is determined through a combination of field (8 dikes), AMS (16 dikes) and thin section analyses (15 dikes). Thirteen dikes have a vertical upward flow, whereas six have an oblique-subhorizontal flow, suggesting a lateral propagation from the summit or eccentric vents of the former Somma edifice. These propagation paths differ from those deducible from the recent activity, as all the 7 fissure eruptions between 1631-1944 were related to the lateral propagation of radial dikes. We propose that these different behaviours in dike propagation may be mainly related to the opening conditions of the summit conduit. The laterally propagating dikes in 1631-1944 formed with an open conduit. Conversely, the vertically propagating dikes may have formed, between 18-30 Ka, with a closed conduit.