

Geologists have identified the various periods of volcanic activity spread over several million years:

↳ Between **13 and 9 M** (Million years BC), the first eruptions were Strombolian and Hawaiian-type eruptions (lava streams, fountains and lakes, effusive activity) with primarily basalt* cinder cones* and related lava streams. The remnants of this “infra-cantalienne” period are more visible to the north of the massif in the thalwegs* (particularly in the Petite-Rhue valley) and in Saint-Flour, the highland town built on a lava stream.

↳ Between **9 and 6.5 M**, a much more explosive* episode took place with the formation of the trachyandesitic* strato-volcano .

This paroxysmal phase corresponds to when the lava flows*, breccia* and rough cinders made of trachyandesite, rhyolite* and trachyte* developed.

These formations are clearly visible over a surface area of 100 km² and form a residual massif of approximately 60 km³ (the volume of the fossilised strato-cone). The strato-volcano, phonolitic* (Puy Griou, Griounou, Puy de l'Usclade, Roc d'Hozières) and trachytic (Puy Mary) dome* activity took place synchronously.

↳ Between **8 and 7 M**, the formation of the strato-volcano was accompanied by detritus avalanches*, each with a volume of several km³. These brecciated deposits (blocks of lava inserted in a rough-cinder cement) form the greater part of the vast accumulation piedmont until 10 km down stream from Aurillac. With a volume of around 250 km³, it also encompasses lahar* and pyroclastic* deposits, proof of the successive destruction of the large strato-cones in the Cantal. These cones are estimated to have reached a height of at least 3800m.

↳ The last phase, known as “supra cantalienne”, was an effusive episode with vast lava streams, basalt in particular, spewing from a multitude of erupting craters (over a surface area of nearly 2000 km²) and forming the “planèzes”. This activity, occurring between **7 and 3 M**, is not so visible in the heart of the massif except in the shape of veins. Plomb-du-Cantal is a remainder of that era.

Quaternary glaciations

The volcanic edifice has since been subjected to the elements. Fluvio-glacial erosion preceded the first cold periods and repeated series of glaciations. The massif's present morphology is partly the heritage of the last Würmian glaciations (15,000 years ago). Horn-type relief* such as Puy Mary, kettles (source of the Impradine and Santoire), U-shaped valleys (Santoire, Petite Rhue, Mars) are the signs left by the glaciers that have modelled the Cantalien valleys.

GLOSSARY

- ⇒ **Detritus avalanche:** Flow from the destabilised side of a volcanic cone. This phenomenon may or may not be associated with volcanic activity and can mobilise several dozen km³ of matter.
- ⇒ **Basalt:** Dark volcanic rock resulting from lava solidification and scoria cones. This is the most widespread volcanic rock in Auvergne.
- ⇒ **Breccia:** Volcanic rock made up of variable-sized angular fragments and a groundmass. It is particularly abundant in Cantalien volcanoes and has been reinterpreted in terms of detritus avalanche deposits.
- ⇒ **Chimney or pipe:** Duct through which magma reaches the surface.
- ⇒ **Dome:** Too viscous to flow freely, lava accumulates around the outlet forming a dome. It can be relatively flat depending on the degree of viscosity of the lava. Rhyolitic, trachytic and phonolitic-type magma creates domes.
- ⇒ **Explosive:** Volcanic activity involving lava that contains a vast amount of dissolved gas which cannot easily escape.
- ⇒ **Horn:** Pyramidal-shaped landmark resulting from glacial erosion. Puy Mary is a fine example.
- ⇒ **Lahar:** Devastating muddy stream in which loose volcanic matter mixes with water.
- ⇒ **Lauze:** Flat stone used on roofs and very common in the department. Different types of rock could be used to make Lauze, often metamorphic rock that splits into sheets, but sometimes also volcanic rock: phonolite.
- ⇒ **Lava:** Magma more or less relieved of gas near the surface where the pressure drops.
- ⇒ **Magma:** Molten matter composed of silicated liquids, rock fragments, crystals and gas. Its highly variable composition determines the degree of viscosity and very different eruptive styles.
- ⇒ **Phonolite:** Very clear volcanic rock. Its creation is often linked to that of domes and sometimes very short, thick streams. It is used locally in building lauze roofs.
- ⇒ **Pyroclast:** Fragmented volcanic matter propelled in explosions liberating magma gas.
- ⇒ **Rhyolite:** Generally clear volcanic rock, resulting from the solidification of a distinctive lava containing more than 70% of silica.
- ⇒ **Scoria:** Small lava stone studded with holes (corresponding to gas bubbles), emitted by non-violent eruptions of fluid lava projected upward. Scoria gathers on the sides of volcanoes to form their characteristic cone.
- ⇒ **Thalweg:** Imaginary line joining the lowest points in a valley and tracing the path of water flow.
- ⇒ **Trachyandesite:** Generic term for a family of volcanic rock (grey and brown) formed by the solidification of lava. It is abundant in Auvergne, particularly on the Cantal massif where it appears as pyroclastic breccia or streams.
- ⇒ **Trachyte:** Very clear volcanic rock. Its high viscosity and richness in gas are the source of dome formations (Puy Mary) and explosive eruptions (glowing clouds, variety of cinders).