

## **Description of items included in the composite volcanoes of the Central Andes database (version 2025-v1)**

The database consists in an Excel spreadsheet. Each of the volcano entries occupies a row. The following data is contained in the spreadsheet:

- Volcano name (columns A-B): name given by the SERNAGEOMIN, SEGEMAR or SERGEOMIN maps, or, if lacking, by specific publications, the de Silva and Francis (1991) database, or the Geonames (2024) database. When no name was found, we give the volcano an unofficial name consisting in the name of a neighboring volcano or other feature (e.g., a lake) plus its location with respect to this volcano or feature in parenthesis (e.g., Volcano (North)). When more than one name was found, we list the other names in an alternate name(s) column. For complex massifs that contain more than one main edifice with distinct names, we give the entry all the names, from north to south or west to east, separated by hyphens. In some cases, the geological map indicates two different names for the same volcano, one 'volcanic' and another 'topographic'; in this case, we list the 'volcanic' name as the main name and the 'topographic' name as the alternate name. We omit the common prefixes 'Cerro', 'Nevado', 'Volcán', 'Cordón' or 'Complejo Volcánico'.
- Geographic location (columns C-J): latitude-longitude and UTM easting and northing (Zone 19, datum WGS84) of the volcano summit and of the centroid of the volcano outline.
- Country or countries where the volcano is located (column K).
- Status (column L): for volcanoes considered active or potentially active following the Red Nacional de Vigilancia Volcánica of SERNAGEOMIN, the Observatorio Argentino de Vigilancia Volcánica of SEGEMAR, Aguilera et al. (2022), Reyes-Hardy et al. (2024) and/or Global Volcanism Program (2024), we list the reasons for their active status: (1) 'Historical', if the volcano has had historical eruption(s); (2) 'Fumarolic', if the volcano has fumarolic activity; (3) 'Radiometric', if the volcano deposits have been dated to the Holocene (usually by the  $^{14}\text{C}$  method, but also by surface exposure,  $^{40}\text{Ar}/^{39}\text{Ar}$ , or zircon double-dating); (4) 'Morphology', if Holocene activity is likely or possible based on youthful, post-glacial morphology.
- Geological map(s) (column M): reference to the SERNAGEOMIN, SEGEMAR and/or SERGEOMIN map or maps that contain the volcano.
- Relative age (columns N-O): assigned relative age of the volcano and source reference. Relative ages span between the Late Oligocene and the Holocene and were compiled mainly from the SERNAGEOMIN, SEGEMAR and SERGEOMIN geological maps. For volcanoes south of  $23^{\circ}\text{S}$ , the Bertin et al. (2022) database was also considered. For several volcanoes we assigned relative ages based on new or previously not considered radiometric ages. For a few volcanoes lacking any previous relative age information, we assigned a rough relative age (Miocene, Pliocene, or

Pleistocene) based on their degree of preservation. Due to the different spatial resolutions of the geological coverage in the study area, and the availability or lack of absolute ages, the relative ages vary in terms of accuracy, from coarse or general, such as ‘Miocene’ or ‘Pleistocene’, to more accurate, such as ‘Middle Miocene’ or ‘Upper Pleistocene’.

- Absolute ages (columns P-Y): all available absolute ages of the identified volcanoes were compiled from the geological maps and the literature. For each volcano, we document: (1) the number of absolute ages; (2) the youngest age (with error); (3) the oldest age (with error); (4) the age span, i.e., the difference between the oldest and the youngest age; (5) the median age (median average of all existing ages); (6) the mean age (mean average of all existing ages); (7) the standard deviation of all existing ages; (8) references for the absolute ages.

- Morphologic type (column Z): we classified the volcanoes into descriptive morphologic types considering both constructional and degradational aspects. The volcanoes are classified into one of six main or first-order constructional types: (1) cone: one conical, radially symmetrical edifice; (2) sub-cone: one sub-conical, elongated edifice; (3) massif: two or more coalescing edifices; (4) pyroclastic shield; (5) lava dome/coulée; and (6) undefined, when assignation was not evident or possible. Secondary or second-order constructional features are added as adjectives to the main type. Cones can be simple (one main vent in the summit region) or complex (two or more main vents in the summit region); neither adjective is added when this distinction is not evident. Massifs can be either elongated (edifices and vents are aligned forming elongated chains or sierras) or irregular (edifices and vents are not aligned), and either compound (formed by few large coalescing edifices) or cluster (formed by many small coalescing edifices). Lava domes can be simple (‘lava dome’), complex (‘lava dome complex’) or ‘coulée’. Main degradational features are added after the type in parenthesis: truncated (edifice is truncated by a large crater or caldera), breached (edifice has a large horseshoe-shaped scar on one of its flanks), or degraded (edifice doesn’t show preserved craters and is strongly incised by valleys or gullies).

- Sector collapse (columns AA-AC): sector collapses are a common feature in the Central Andes. For each volcano, we appraised the possibility or likelihood of a past sector collapse event based on existing publications and maps, and our morphological evaluation of the TanDEM-X DEMs and Google Earth imagery: (1) ‘Confirmed’: sector collapse(s) has been studied/described in detail (either in a specific publication and/or in a geological map); collapse scar and/or debris avalanche deposit are clearly visible in remote sensing images; (2) ‘Probable’: collapse has not been studied/described in detail, but collapse scar and/or debris avalanche deposit are mapped in a geological map, a specific publication, and/or are listed in Francis and Wells (1988) or Bustos et al. (2025), or are clearly visible in remote sensing images; (3) ‘Possible’: no collapse has been studied/described nor listed in Francis and Wells (1988), but scar (not necessarily collapse-related) is mapped in a geological map and/or

visible in remote sensing images, or possible debris avalanche deposit is visible and/or mapped by Bertin et al. (2022); (4) 'No evidence': no collapse has been studied/described, no evident scar or debris avalanche deposit has been mapped or is visible in remote sensing images; however, we note that even in these cases a sector collapse event may have occurred, but the volcano has either healed, masking the collapse features, or is old and eroded.

- Morphometric parameters (columns AD-AP): morphometric data for each volcano were computed with the MORVOLC algorithm (Grosse et al., 2009, 2012) applied on the 30 m spatial resolution TanDEM-X DEMs. The 30 m DEMs were used, instead of the 12 m DEMs, to maximize computational efficiency, considering that the difference in resulting morphometric measurements between the two DEM resolutions is minor compared to differences related to the basal outline and the DEM type (van Wees et al., 2024). MORVOLC computes a set of parameters that characterize volcano size and plan and profile shape. To calculate volcano height and volume, MORVOLC fits an inverse distance weighting (IDW) 3D basal surface to the basal outline. The parameters listed in the database are:

- summit elevation (m a.s.l.): maximum elevation of the DEM contained within the edifice outline;
  - elevation of lowest point of the volcano outline (m a.s.l.): minimum elevation of the DEM contained within the edifice outline;
  - basal area (km<sup>2</sup>): area covered by the edifice;
  - average basal width (km): diameter of a circle with area equal to the basal area;
  - height (m): maximum elevation difference between the volcano surface and the interpolated IDW basal surface;
  - maximum height (m): maximum elevation difference between the volcano surface and a horizontal base with elevation equal to the lowest edifice outline point;
  - volume (km<sup>3</sup>): the space contained between the volcano surface and the interpolated IDW basal surface;
  - maximum volume (km<sup>3</sup>): the space contained between the volcano surface and a horizontal base with elevation equal to the lowest edifice outline point;
  - height/basal width ratio: the ratio between the edifice height and the edifice average basal width;
  - mean ellipticity index: dimensionless index that quantifies the elongation of elevation contours, considering an equidistance of 50 m;
  - mean irregularity index: dimensionless index that quantifies the irregularity or complexity of elevation contours, considering an equidistance of 50 m;
  - mean slope (°): average value of slope map covering the whole edifice;
  - SD slope (°): standard deviation of slope map covering the whole edifice.
- Comments (column AQ).

## References

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