Magma fragmentation and timing of water-magma interaction of La Joya de Yuriria maar volcano and La Sanabria-San Roque tuff ring complex, Mexico

Andrés Josué Campos Domínguez, Pooja Kshirsagar, Maria de Jesus Puy y Alquiza, and Raul Miranda Aviles
Universidad de Guanajuato, División de Ingenierías, Departamento de Ingenierías en Minas, Metalurgia y Geología., Guanajuato, Mexico (pv.kshirsagar@ugto.mx, aj.camposdominguez@ugto.mx)

La Joya de Yuriria maar volcano and La Sanabria-San Roque tuff ring complex manifests at the southern and northern extreme of the NNW-SSE trending clusters of phreatomagmatic vents of Valle de Santiago volcanic field, which forms the NE part of the famous Michoacan-Guanajuato Volcanic Field (MGVF), central Mexico. La Sanabria-San Roque complex is located in the south of the town of Irapuato and is composed of three tuff rings namely San Joaquin (SJ), La Sanabria (LS) and San Roque (SR). Their tephra deposits were studied at 7 different active quarries, which suggests that the San Joaquin tuff ring was formed before La Sanabria-San Roque tuff ring complex. San Joaquin is composed of medium-size lapilli flow (Mdφ=-2.05 to -3.90, oφ=2.00 to 2.58) and fine ash surge units and contains different types of lithics and juvenile fragments (50-68 vol.%). About four types of lithics were identified namely: grey-colored vesicular basaltic andesites (9-27 vol.%), grey-colored non-vesicular basaltic andesites (17-19 vol.%), white lithics (sediments 0-1 vol.%), red-colored lithics (volcanic breccias 1-3 wt.%), along with few plagioclase crystals (0.54-0.66 vol.%).

La Sanabria-San Roque tuff ring complex deposits are exposed at quarries 2, 5 and 8 and are composed of intercalated flow (Mdφ=-1.65 to -2.15, oφ=1.00-1.83) and fallout (Mdφ=-2.00 to -6.10, oφ=2.00) units with juvenile content from 41-87 vol.% and four different types of lithic fragments: grey-colored vesicular lithics (1-20 vol.%), grey-colored compact lithics (2-6 vol.%), white-colored lithics (sediments 0-10 vol.%), and red-colored lithics (rhyolites and/or volcanic breccias) around 0-3 vol.%.

La Joya de Yuriria is currently located on the southern margin of the artificial lake of Yuriria and its tephra sequence is composed of mostly fallout units (Mdφ=-4.45 to -4.60, oφ=1.88 to 2.55), followed by flow units (Mdφ=-2.95 to -3.800, oφ=1.93 to 2.05) that are separated with both indurated, fine-ash wet and dry surge units of which a very particular fine-ash dry surge unit (Mdφ=-0.95, oφ=2.03), yellowish in color (due to oxidation?), may represent a short-term break within the phreatomagmatic activity. It is also composed of flow units (Mdφ=-1.50 to -2.95, oφ=1.40 to 3.43) that are clast supported, friable and contains medium to coarse lapilli size fragments that are rich in accidental lithics with very juvenile clasts (<33 vol.%) of basaltic andesite (SiO₂= 54.4 wt%, Na₂O+K₂O= 5.21 wt%) with very few juvenile content (5-37 wt.%), except at
VS-1741-P7 (85 vol.%) and abundance of light grey colored angular lithics that were classified as vesicular (4.51 vol.%) and non-vesicular (1-66 vol.%) with few reworked lithics (1-5 vol.%) and altered lithics (1-5 vol.%).

Vesicularity index on 2741 juvenile clasts from these vents was utilized to determine the magma fragmentation and the timing of magma-water interactions (especially exsolution of volatiles before or during mag-water interaction). To corroborate this, Bubble Nucleation Density and crystal texture of primary vesicles within glass shards were also performed to validate the interpretations made.