



EGU22-8873

Syn-eruptive edifice collapses during the Cumbre Vieja (Canary Islands) 2021 eruption

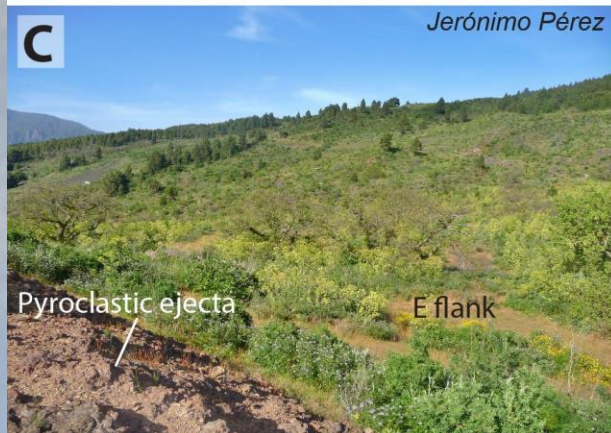
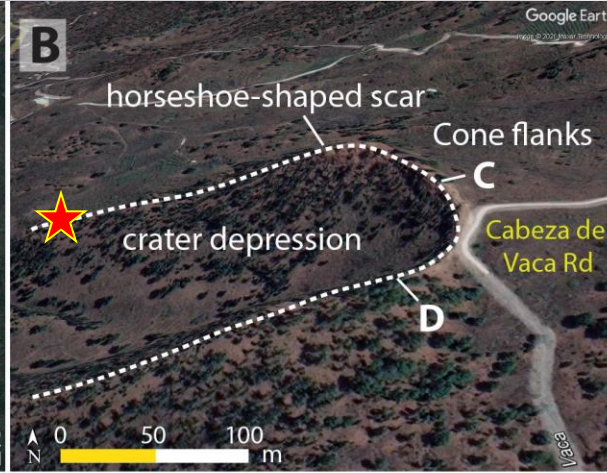
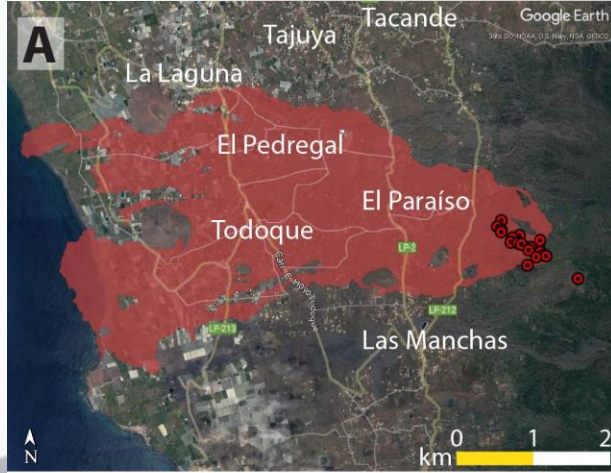
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Pre-eruptive landscape



- Eruption produced in the remnants of an old volcanic structure
- Monogenetic cone, horseshoe-shaped, breached to the west
- NW-SE trending fissure
- Steep sided surface 26°



Characteristics of the 2021 eruption



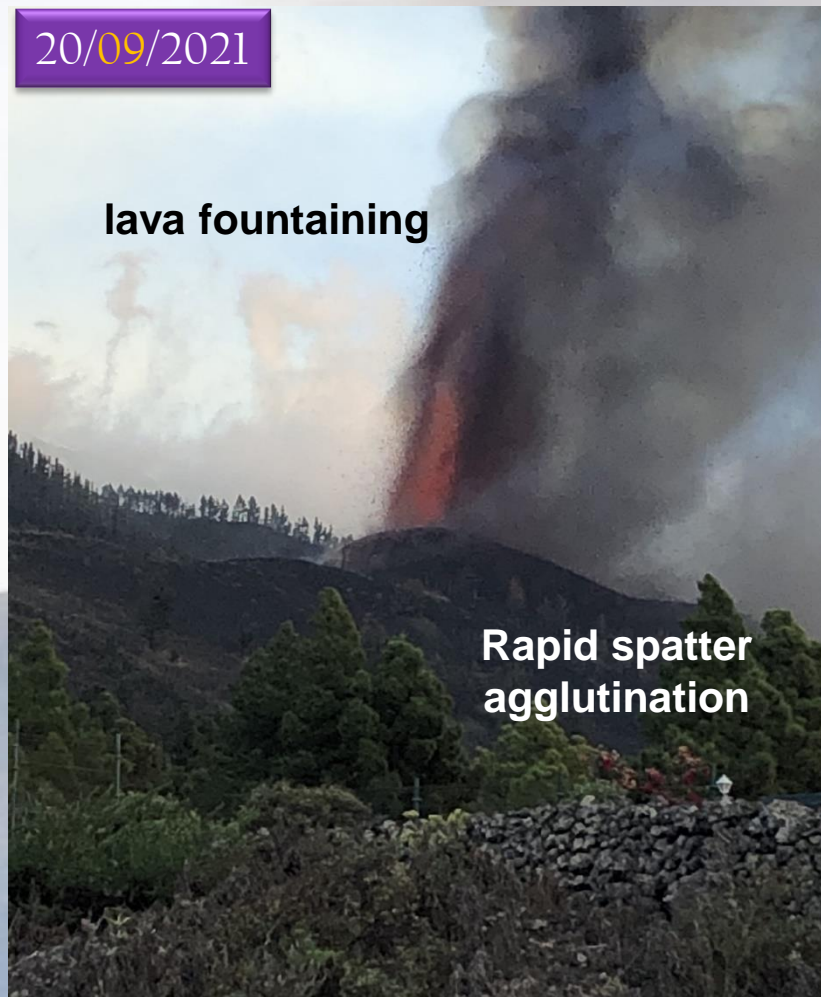
- Simultaneous explosive and effusive activity
- Lava fountaining, Strombolian explosions, rapid Strombolian, spattering, ash-rich jets, and ash venting (see Scarlato *et al.*, this conference)
- About $23 \times 10^6 \text{ m}^3$ of tephra (see Bonadonna *et al.* this conference)
- Formation of a ~200 m high complex edifice
- Rapid spatter agglutination near the active vents (see Solana *et al.* COV 2022)



20/09/2021

lava fountaining

Rapid spatter
agglutination

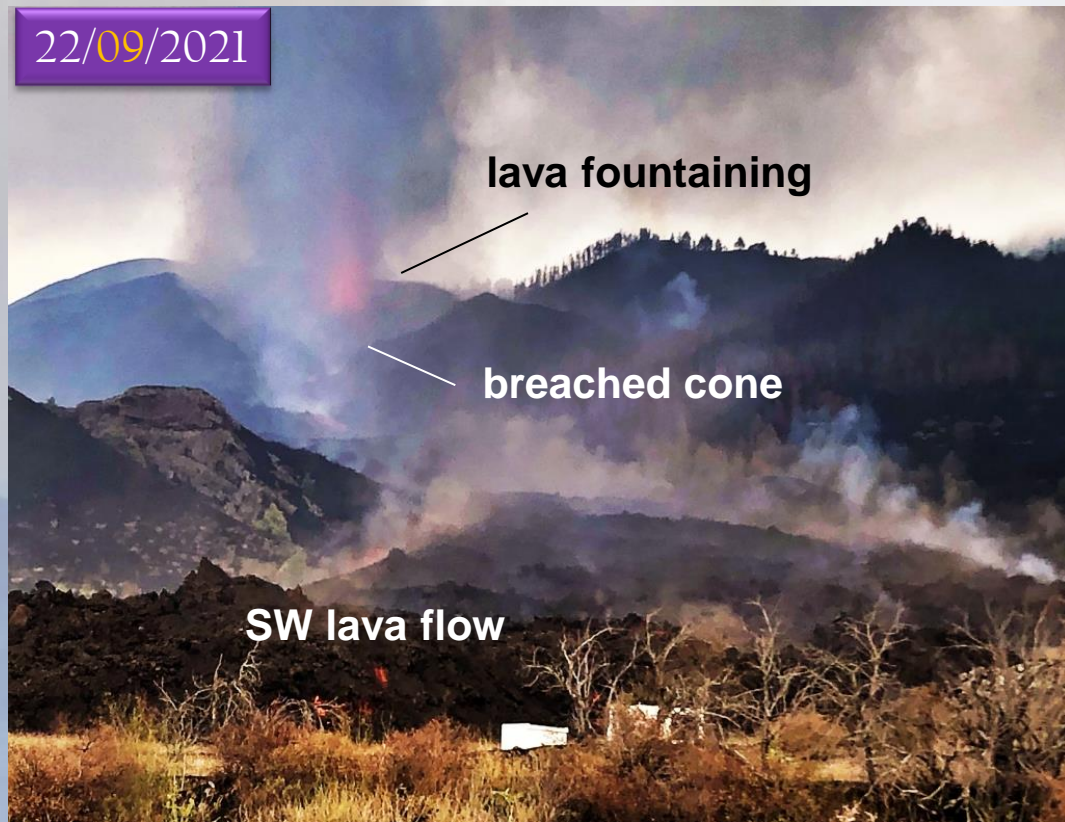


22/09/2021

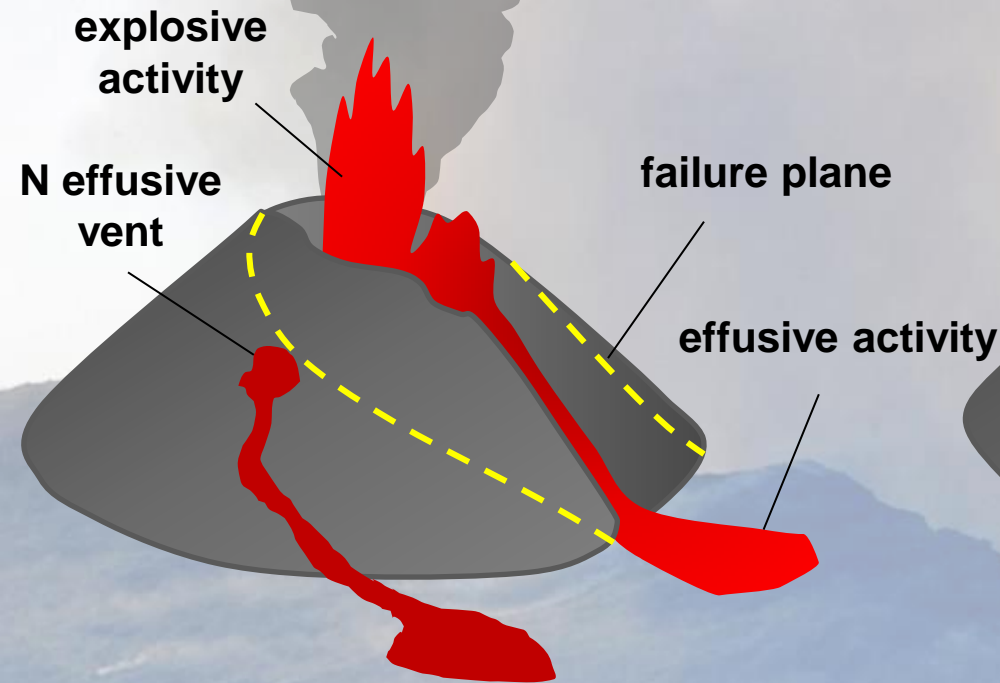
lava fountaining

breached cone

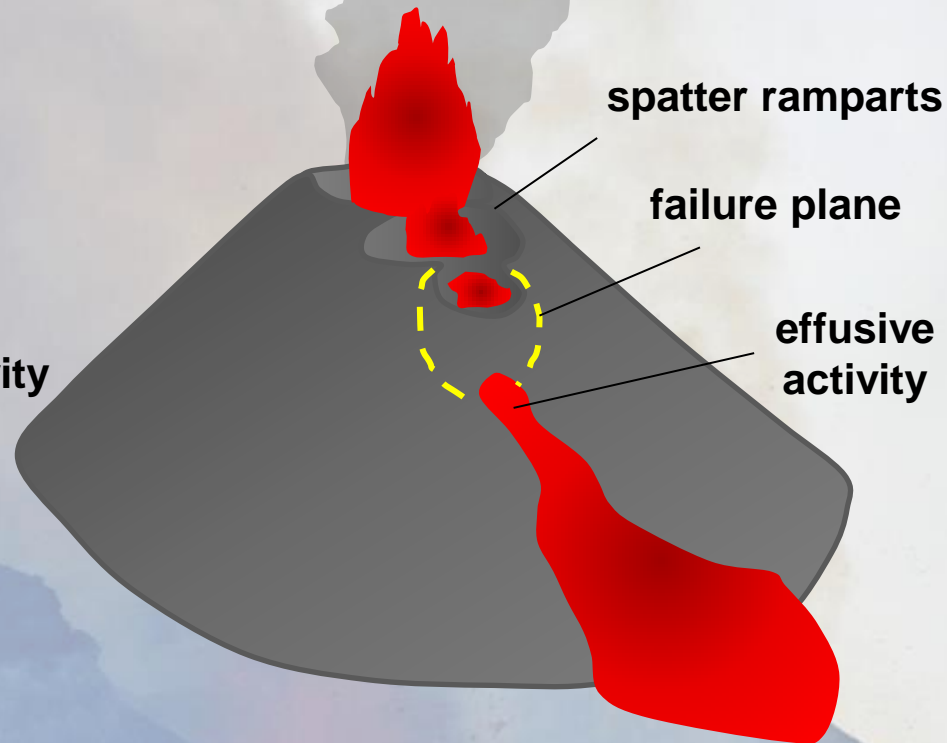
SW lava flow



Types of lateral collapses

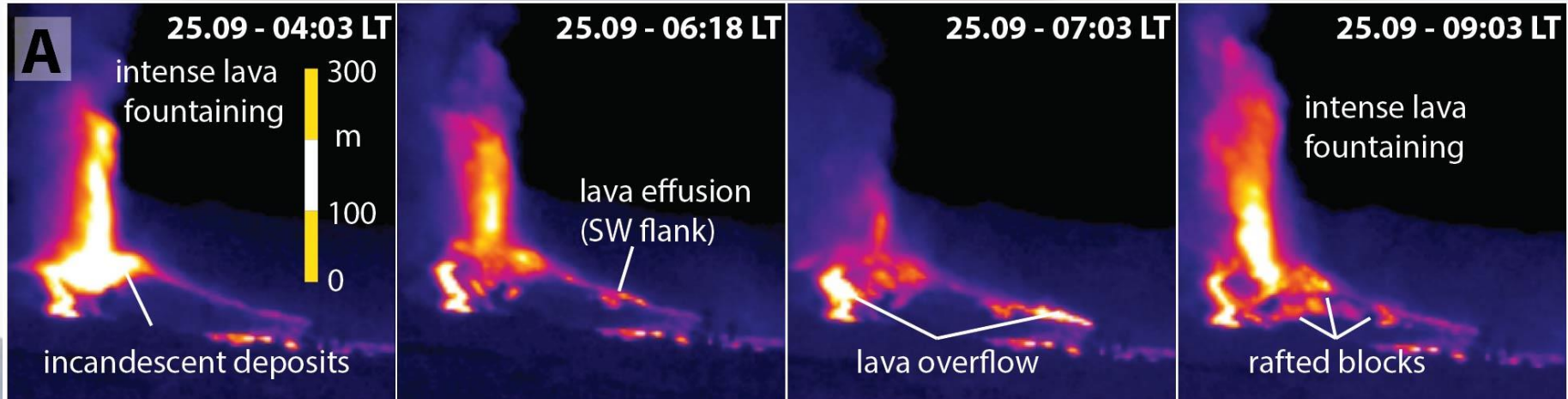


i) Deep-seated edifice failure
25 September 2021

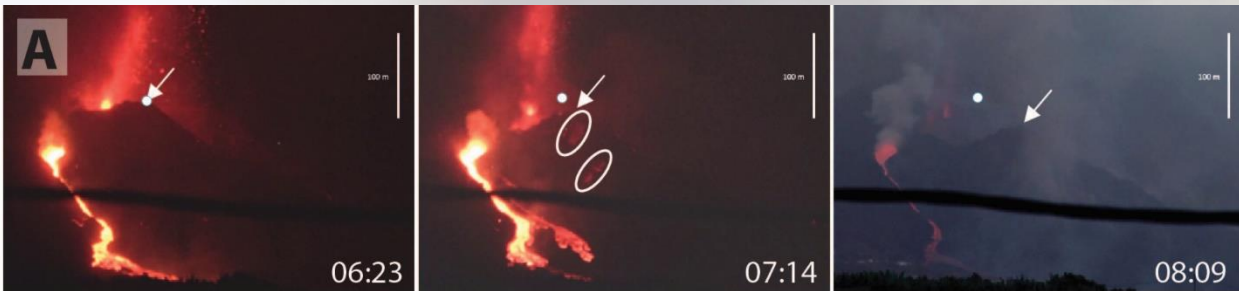


ii) Shallow-seated spatter rampart collapse
Frequent during the eruption

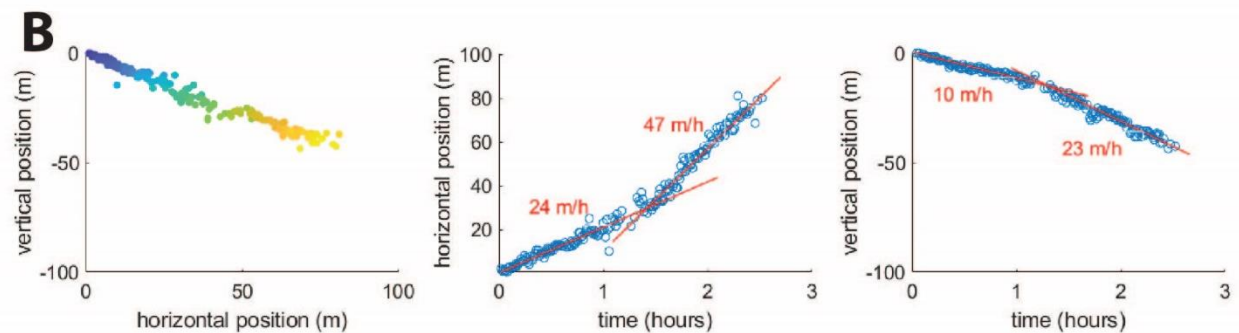
Type i) collapse: 25 September 2021

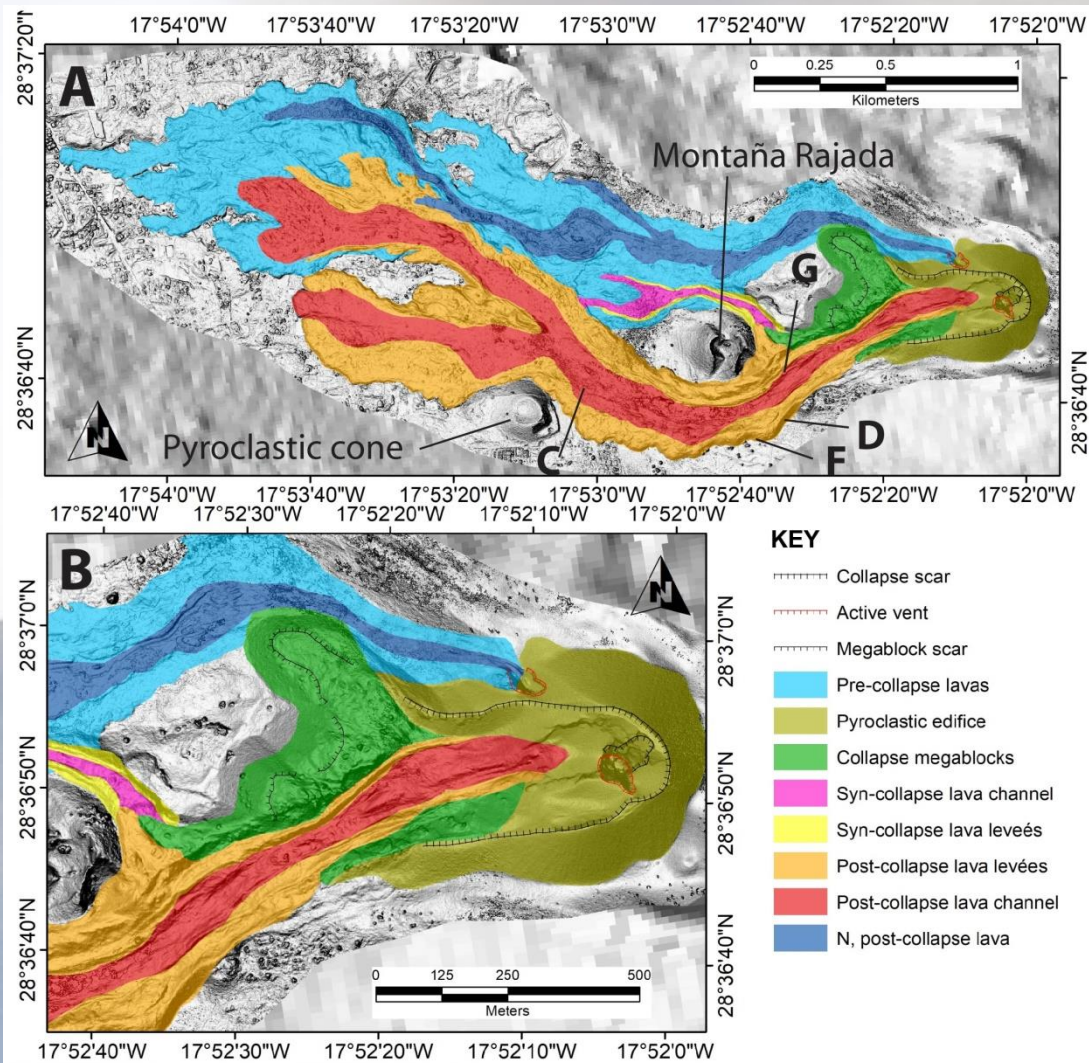


- Intense lava fountaining activity in the uppermost vents
- Lava overflow in the lower SW flank, which acted as a deforming substrate (lava seep)
- Progressive failure of the flank; lava flow transporting rafted blocks on top.



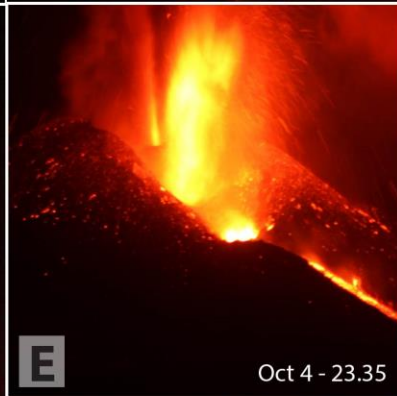
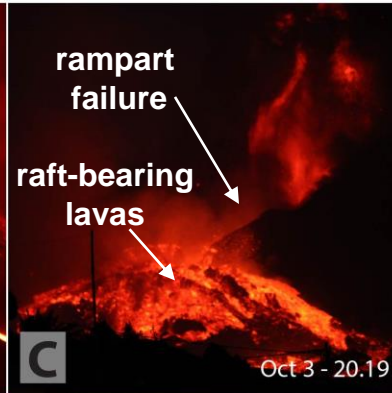
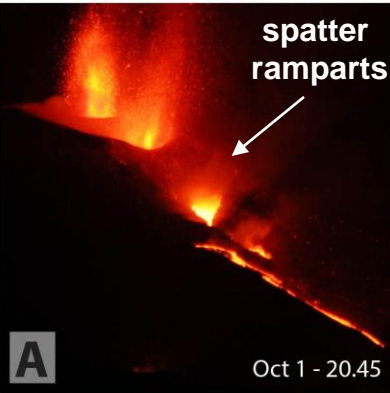
Megablocks moved downslope at minimum speeds of 34 to 70 m h⁻¹





- DSM on 27 September 2021
- At least $5.54 \times 10^6 \text{ m}^3$ collapsed
- U-shaped scar (215 x 450 m)
- Deposition of proximal megablocks (0.12 km^2)
- Blocks up to 20 m long transported on top departing lava flows.
- Prominent levees and distinctive central channel





- Direct observation and thermal imaging.
- Rapid spatter agglutination (spatter piles, see Solana et al. COV 2022) forming ramparts
- Rampart failure leading to raft-bearing lavas
- Metric rafts transported on top of lava
- Lava fountaining events and ash laden columns (recycling?)
- Rapid transformation of the cone morphology
- Implications for lava flow drainage/hazard and edifice instability



05/10/2021

rampart

10/10/2021

lava overflows

11/10/2021

Morphologic transformation

lava
channel

lava "fan"

rampart
failure



Other related talks (in this session)

13:50–13:56 | EGU22-9297 ★

[Styles of explosive activity during the 2021 Cumbra Vieja eruption, as illuminated by high-frequency imaging and acoustic sensing](#) ▶

Piergiorgio Scarlato, **Jacopo Taddeucci**, Daniele Andronico, Tullio Ricci, Riccardo Civico, Elisabetta Del Bello, Laura Spina, Luca D'Auria, Maria Asensio-Ramos, David Calvo, Eleazar Pádrón, Pedro Hernández, and Nemesio Pérez

13:56–14:02 | EGU22-5041 ★ | **Highlight** | Virtual presentation

[Faulting and crater development controlled by pre-existing topography - evidence from drone and satellite observations during the 2021 Cumbre Vieja eruption](#) ▶

Thomas R. Walter, Edgar Zorn, Pablo J. Gonzalez, Simon Plank, Valeria Munoz Villacreses, Alina Shevchenko, Nicole Richter, and Carla Valenzuela Malebran

14:02–14:08 | EGU22-11927 ★ | **Highlight**

[Characterization of the tephra deposit associated with the 2021 eruption of Cumbre Vieja \(La Palma\)](#) ▶

Costanza Bonadonna, Marco Pistolesi, Marija Voloschina, Maria-Paz Reyes Hardy, Lucia Dominguez, Alba Martin, Jorge Eduardo Romero Moyano, Camille Pastore, Daniele Andronico, Corrado Cimarelli, Beverley Coldwell, Ulrich Kueppers, Fátima Rodríguez, Matt Pankhurst, Margherita Polacci, Piergiorgio Scarlato, and Jacopo Taddeucci

14:08–14:14 | EGU22-9986 ★ | **ECS** | On-site presentation

[Preliminary results from textural studies on tephra deposits erupted during the 2021 eruption at Cumbre Vieja volcano](#) ▶

Alba Martín Lorenzo, Daniele Andronico, Fátima Rodríguez, Beverley Coldwell, Matt Pankhurst, Jacopo Taddeucci, Piergiorgio Scarlato, Costanza Bonadonna, Marco Pistolesi, Jorge E. Romero, Gladys Melián, and Nemesio M. Pérez



Thank you!