



UNIVERSITÀ  
DI TRENTO

Dipartimento di  
Fisica



# PhD Program in Space Science and Technology - SST

## Volcanic Giants

**What we know, what we still don't know, what we may never know about  
the largest explosive eruptions on Earth**

**Specific Seminar – Curriculum 2**

**2023, April 17, 11 a.m.**

### Speaker:

Dr. Paolo Papale – National Institute of Geophysics and Volcanology - INFN (Pisa section)

### Abstract:

Volcanic super-eruptions are the most violent manifestation of the endogenous forces acting in our planet, with a destructive potential capable of threatening the same fabric of our civilization. Still, there is no plan to defend ourselves from such potentially devastating events. Recent analyses reveal new features of the global time-size distribution of volcanic eruptions, showing that i) they are Poissonian (memoryless) events, implying that the previous proposal that a volcanic super-eruption is now “overdue” does not hold any meaning; ii) the frequency-size relationship for explosive volcanic eruptions above a relatively small volume threshold (order  $0.1 \text{ km}^3$ ) is of the power law type, opening to the existence of inherent limitations in anticipating the size of an impending eruption. Such a power law distribution compares well with the observed self-similarity of explosive eruptions over at least six orders of magnitude, and may explain why we haven't been able so far to produce any robust framework to relate observed precursors to associated eruption size: that would be a direct consequence of one fundamental character of explosive volcanic eruptions on Earth, rather than just being a limit in our understanding. On the other hand, knowledge of the global time-size distribution allows i) an estimate of the global volcanic hazard, and particularly of the hazard associated with the occurrence of cataclysmic volcanic super-eruptions, and ii) the determination of the global rates of volcanic production, which relate to virtually any other global process on Earth such as global tectonics, mantle dynamics, and climate change.

### Online attendance:

[meet.google.com/xts-oiwu-yax](https://meet.google.com/xts-oiwu-yax)

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