Dominica: transcrustral magmatic system and eruptive halogen budgets

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Under review (minor revisions) in Geochemistry, Geophysics, Geosystems
Geological Context

- Ignimbrites (Balcone-Boissard et al. 2018)
- Plinian eruptions (this study)

- Boudon et al. (2017)
Blue circles correspond to ignimbrites from Balcone-Boissard et al. (2018)
**Storage conditions**

- **MagmaSat**: most of inclusions: 50 – 150 MPa
- **VolatileCalc**:
  - Most of inclusions: 50-200 MPa
  - Degassing path (closed system, 0-1% exsol)

- Storage pressures:
  - Phase equilibrium requires pressures lower than 200 MPa (≤ 7.1 km deep)
- Storage temperatures:
  - 860 – 890°C based on OPX-CPX, OPX-melt and CPX-melt equilibrium (Putirka 2008)
  - PLAG-melt and MGT-melt thermometer unreliable because of cristallizations histories

- **Cl-H₂O (isobares Webster, 1997)**:
  - Less precise than H₂O-CO₂
  - Consistent results

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Gery crosses: ignimbrites from Balcone-Boissard et al. (2018)
- Halogen ratios
  - $=f(\text{source})$
  - Preserved during degassing
  - Identical for both plinian eruptions and ignimbrites

- Trace element ratios
  - $=f(\text{source})$
  - Identical for both plinian eruptions and ignimbrites

- Common source of magmas for all eruptions

Gery crosses: ignimbrites from Balcone-Boissard et al. (2018)
Degassing budgets

- Normalized degassing budgets of each element are the same order of magnitude from an eruption to another.
- S degassing is the same order of magnitude as Br.
- F degassing is 1 order of magnitude higher than S and Br.
- Cl degassing is 2 orders of magnitude higher than S and Br.
- Halogen elements must be taken into account as reactive species emitted in volcanic plumes.