# Internship at the Instituto Geofísico del Ecuador (IGEPN)

## 01.08.16 - 30.09.16

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# Pyroclastic Density Currents

- Gravity-driven rapidly moving mixtures of hot volcanic particles and gas that flow across the ground.
- Composed of dense basal granular layer with an overlying dilute ash cloud

- Temperature: up to ~600–800 ° C
- Velocity: 50-200km/h
- Volume: <1$km^3$ - thousands of $km^3$, may extend over 100 km from their source

Druitt (1998), & Roche (2013)

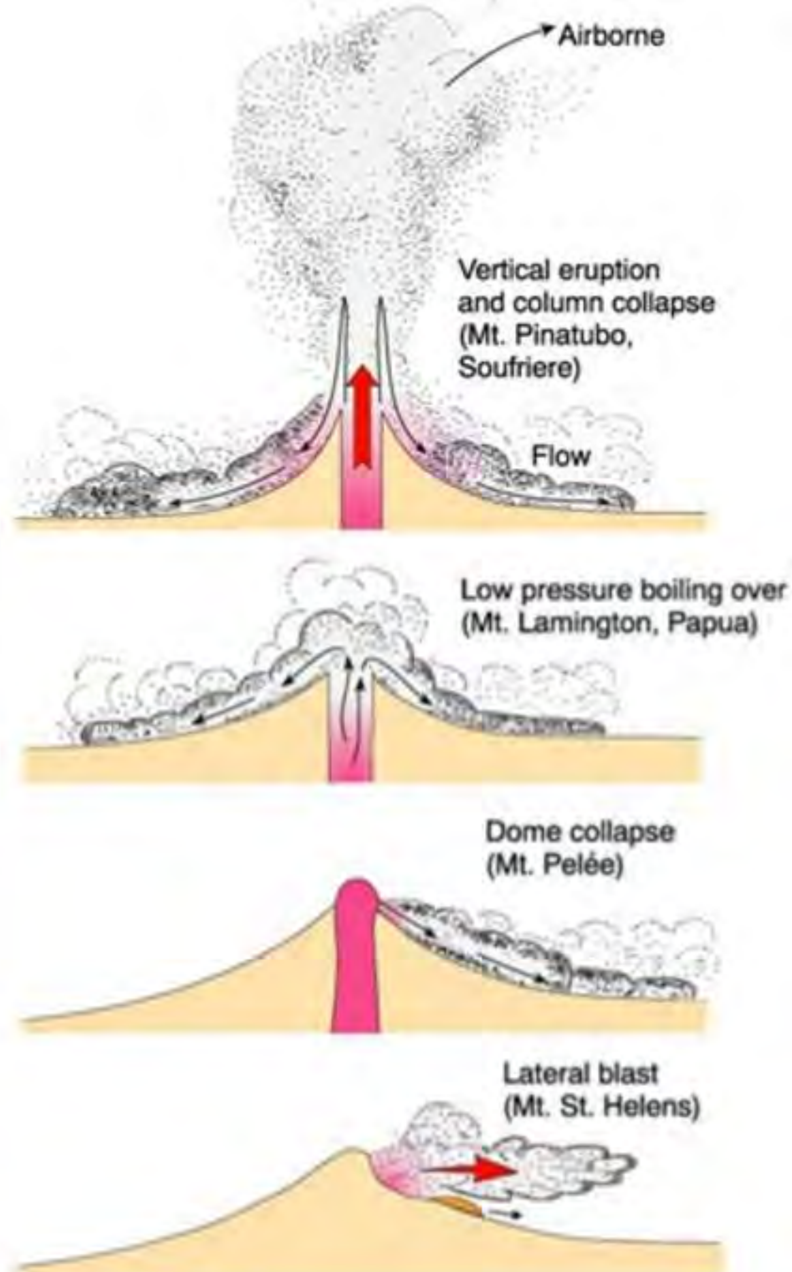
# PDC Eruptions

- Eruption column collapse
  - pumice-rich ignimbrite

- Upwelling and overflow with no eruption column
  - pumice-poor ignimbrite

- Lava dome/flow collapse
  - “block and ash flow”

- *Lateral blast*



# Project Objective

- Search for a correlation between the particle density and the grainsize distribution of a specific sample with its deposit density.

- Validate a new method implemented by F. Vásconez to estimate the deposit density.

# Our Deposits



- 781 – 11 kaBP: effusive dome formation and BAFs
- ~2,485 – ~2,240aBP: series of explosive events. Pumice Flows and surge

Andrade, D. (2002)

- PDC deposits from ravines Palmahurco (scoria flow, 2014) and Chontapamba (surge, 2006)

García, J. (2016)

# "Gigantic cone" (modified by Vásconez, 2015)

$$volume_{deposit} = 23,593 * (\#\ plastic\ balls) - 0,7497 \quad (cm^3)$$

# "Gigantic cone" (modified by Vásconez, 2015)

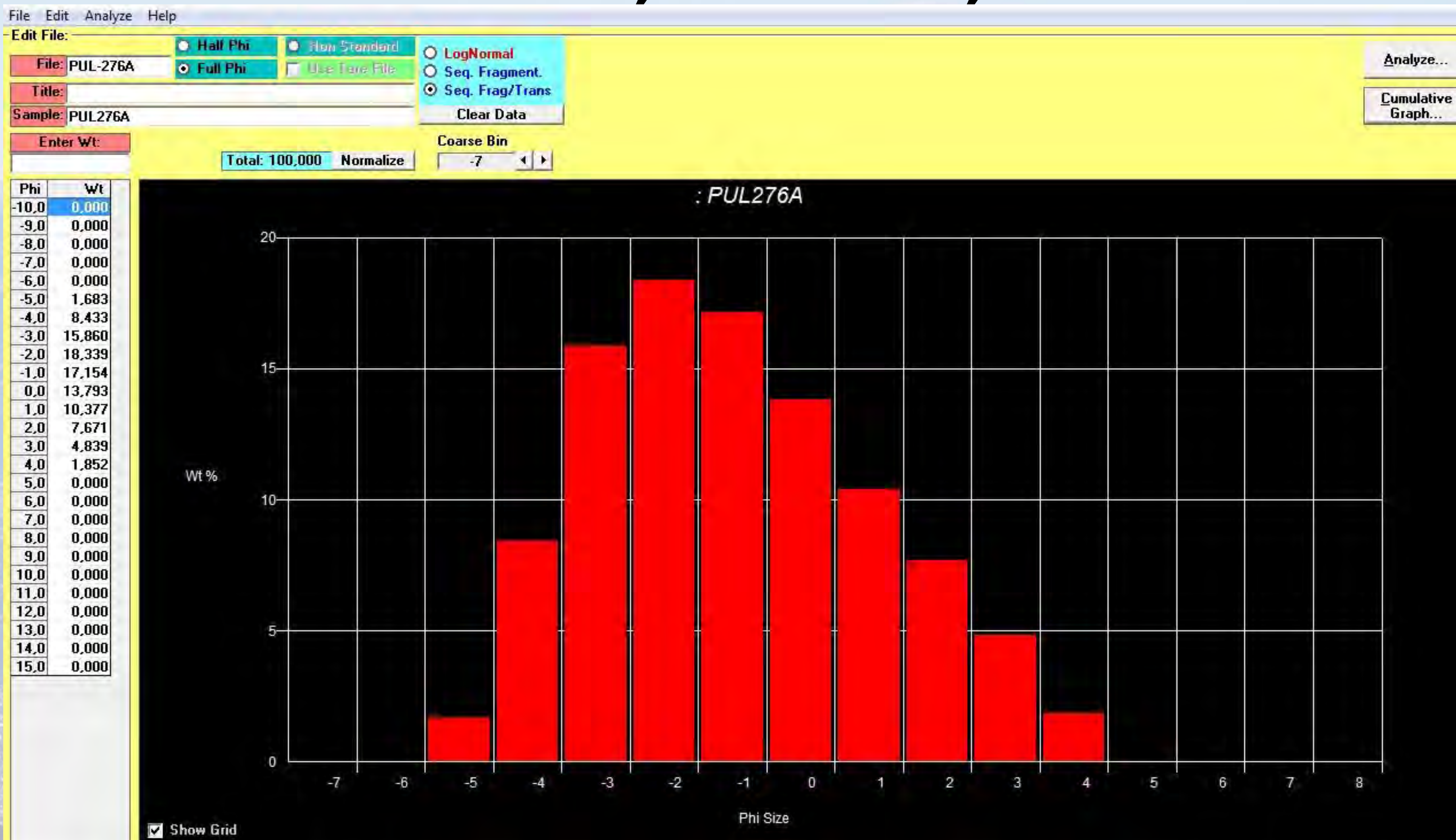
mass

$$\rho_{deposit} = \frac{\text{mass}}{\text{volume}}$$

volume

# Dividing and Sieving


# Grain size distribution analysis: KWare SFT, Woheltz, 2013.

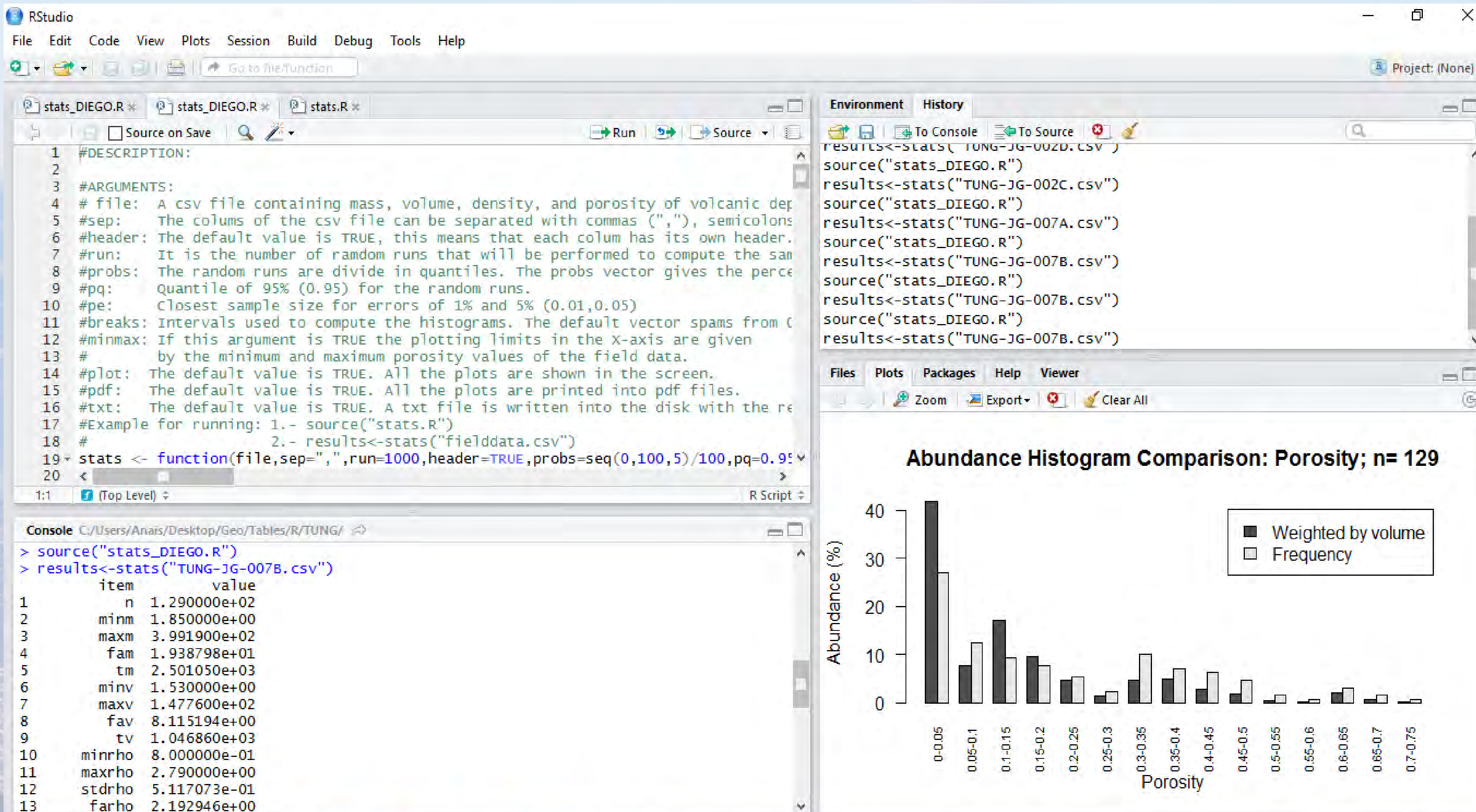


# Paraffin-method


$$|\vec{E}| = |\vec{P}| = mass_{fluid} * g = (\rho_{fluid} * volume_{fluid}) * g$$

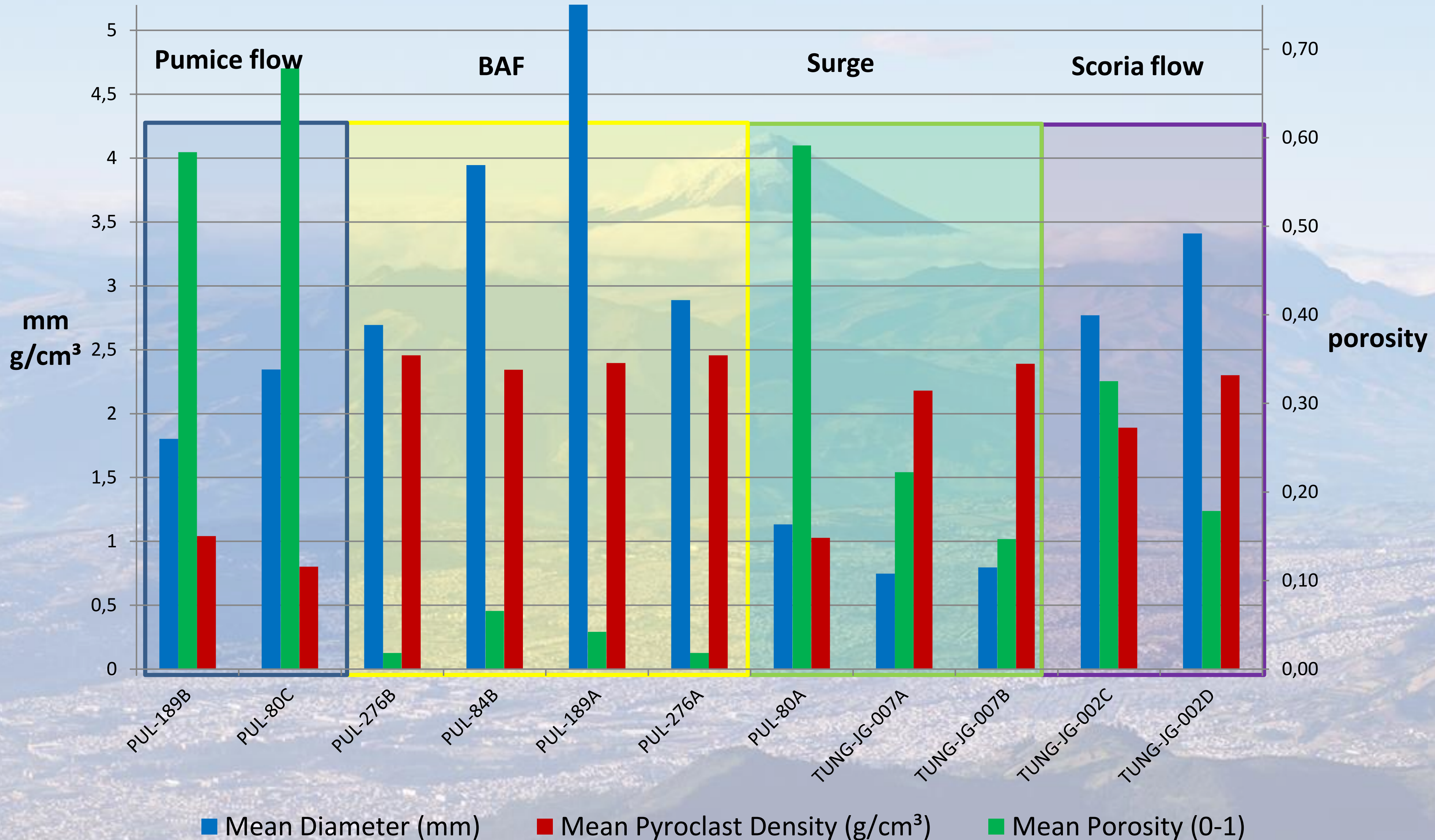
$$mass_{displaced\ \ water} = volume_{clast}$$

# Statical analysis: pyroclast density and porosity: Bernard et al., 2015




METHODS

# Mean comparisson: granulometry, pyroclast density and porosity

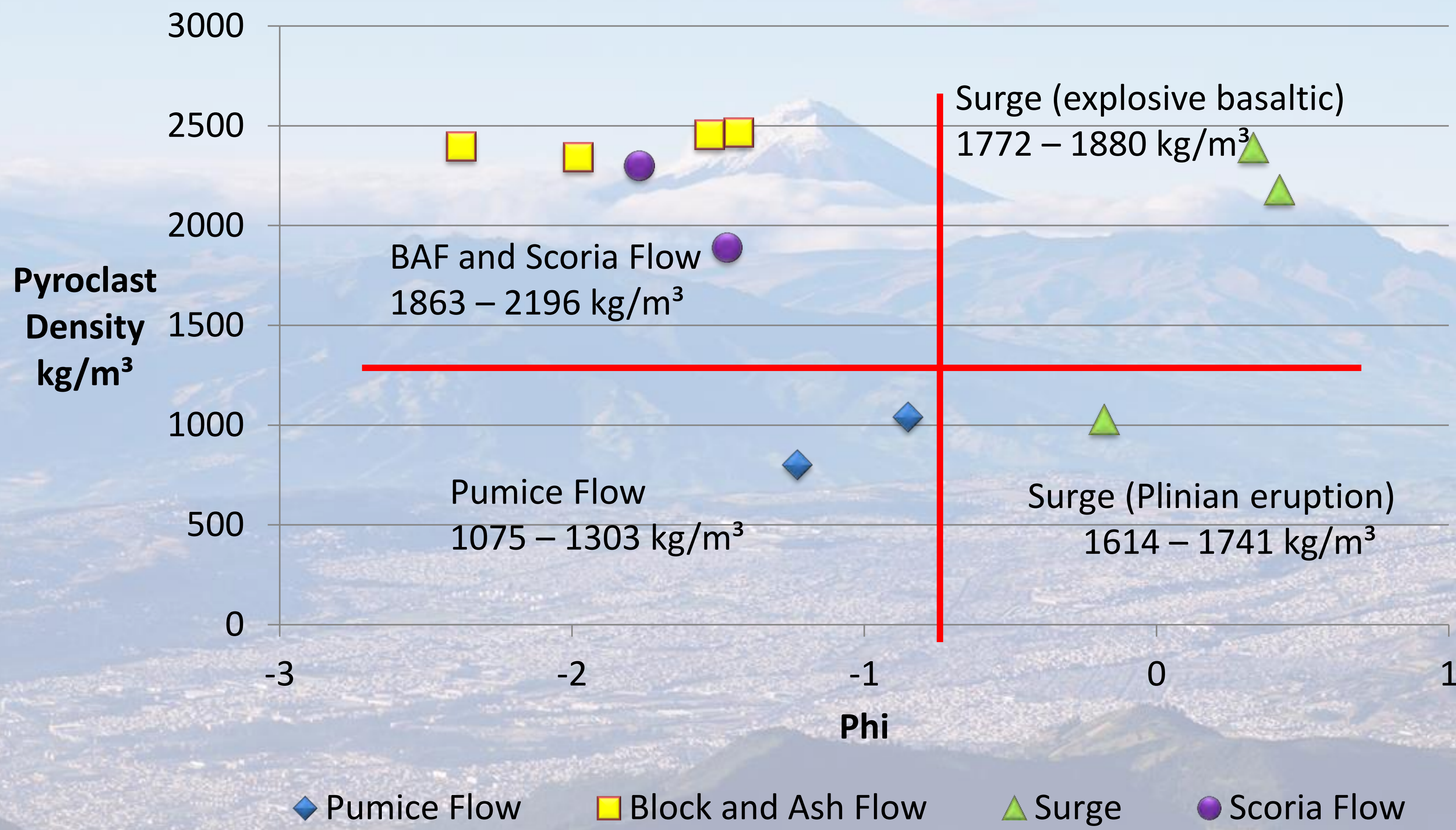



DISCUSSION

# Conclusion/Summary

| | Grainsize mm[ϕ] | Pyroclast density (-4ϕ) kg/m³ | Porosity (0-1) | Deposit density kg/m³ |
|---|---|---|---|---|
| **Pumice Flow** | 1,8[-0,85] – 2,35[-1,23] | 802 – 1041 | 0,58 – 0,68 | 1075 – 1303 |
| **BAF** | 2,7[-1,43] – 5,21[-2,38] | 2343 – 2467 | 0,02 – 0,07 | 1863 – 2196 |
| **Surge (explosive Basalitic)** | 0,74[0,42] – 0,8[0,33] | 2179 – 2390 | 0,15 – 0,22 | 1772 – 1880 |
| **Surge (Plinian eruption)** | 0,46[1,12] – 1,13[-0,18] | 1027 | 0,59 | 1614 – 1741 |
| **Scoria Flow** | 2,77[-1,47] – 3,41[-1,77] | 1890 – 2300 | 0,18 – 0,33 | 1863 – 2026 |

# Pyroclast Density (-4ϕ) vs. Mean Diameter



**"Try to summarize what you did and explain one important way that the experience built on your previous studies or contributes to your future plans."**

**– R. Plumley**