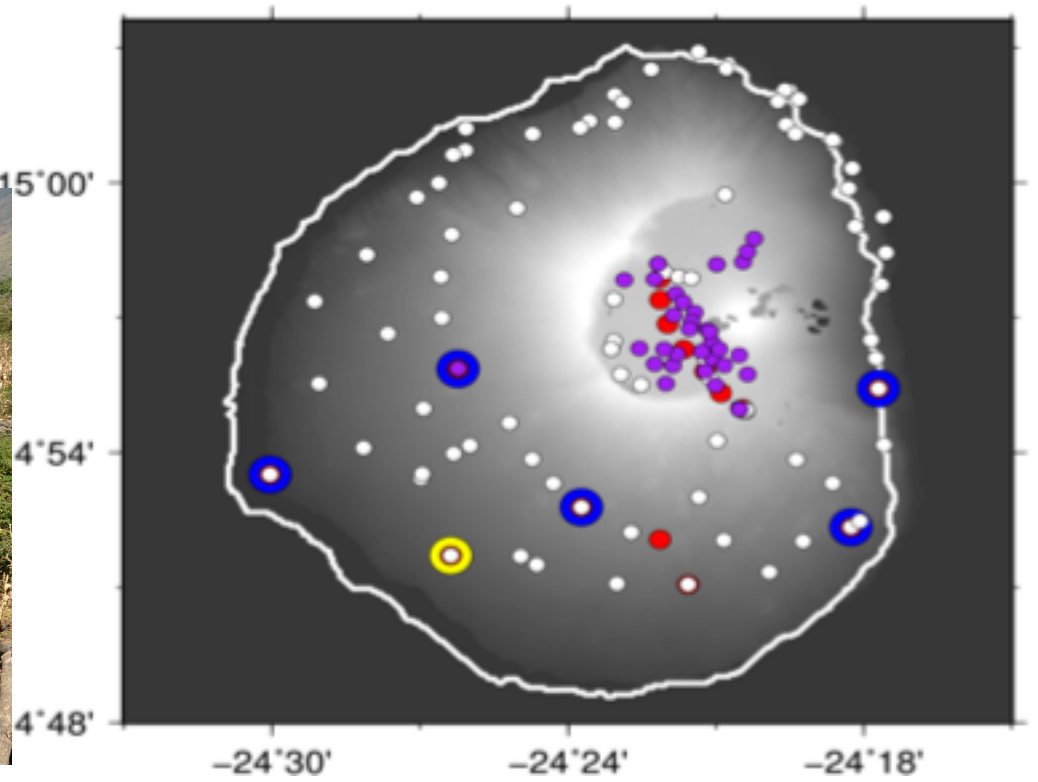
FIRE: WP4 Computation of a density model using gravity

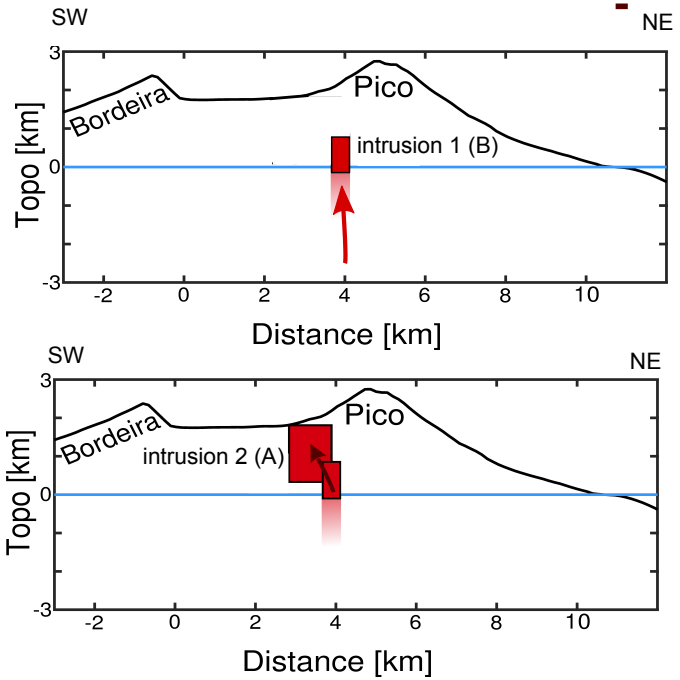
Machiel Bos

AL1: Volcanic structure

- Second field campaign carried out 8-20 January 2017. New points are shown in purple..
- Observers were Rui Fernandes, Pedro Almeida and Stephanie Dumont.



Gonzalez et al. (2015)

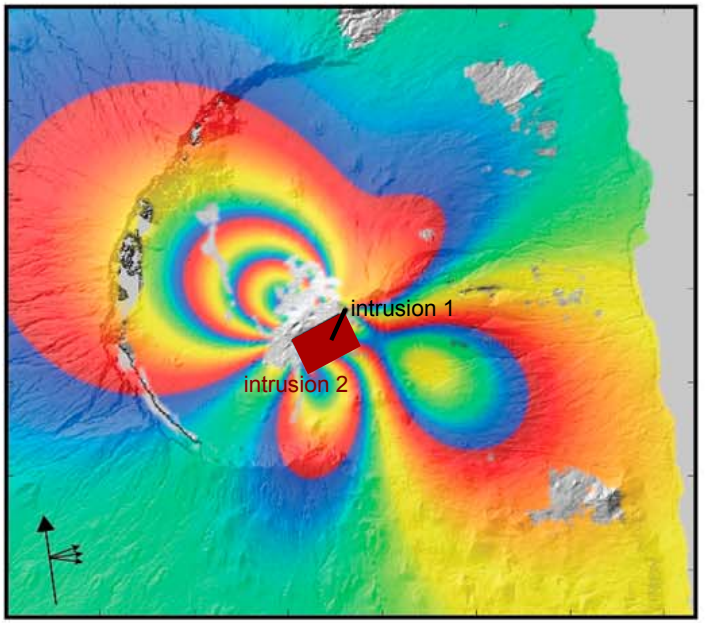


in black for results from model based on Sentinel data,
in blue on radarsat2 data

intrusion 1
sub-vertical: dip = 88°
length: 777 m / 394 m
width: 1067 m / 712 m
opening: 2.41 m / 5.58 m
volume: 1998032 m3 / 1565346 m3
for a basalt density ranging: 2.7-3.2 (g/cm3)

TOTAL mass range for intrusion 1:
4226.4 -6393.7 10^6 kg

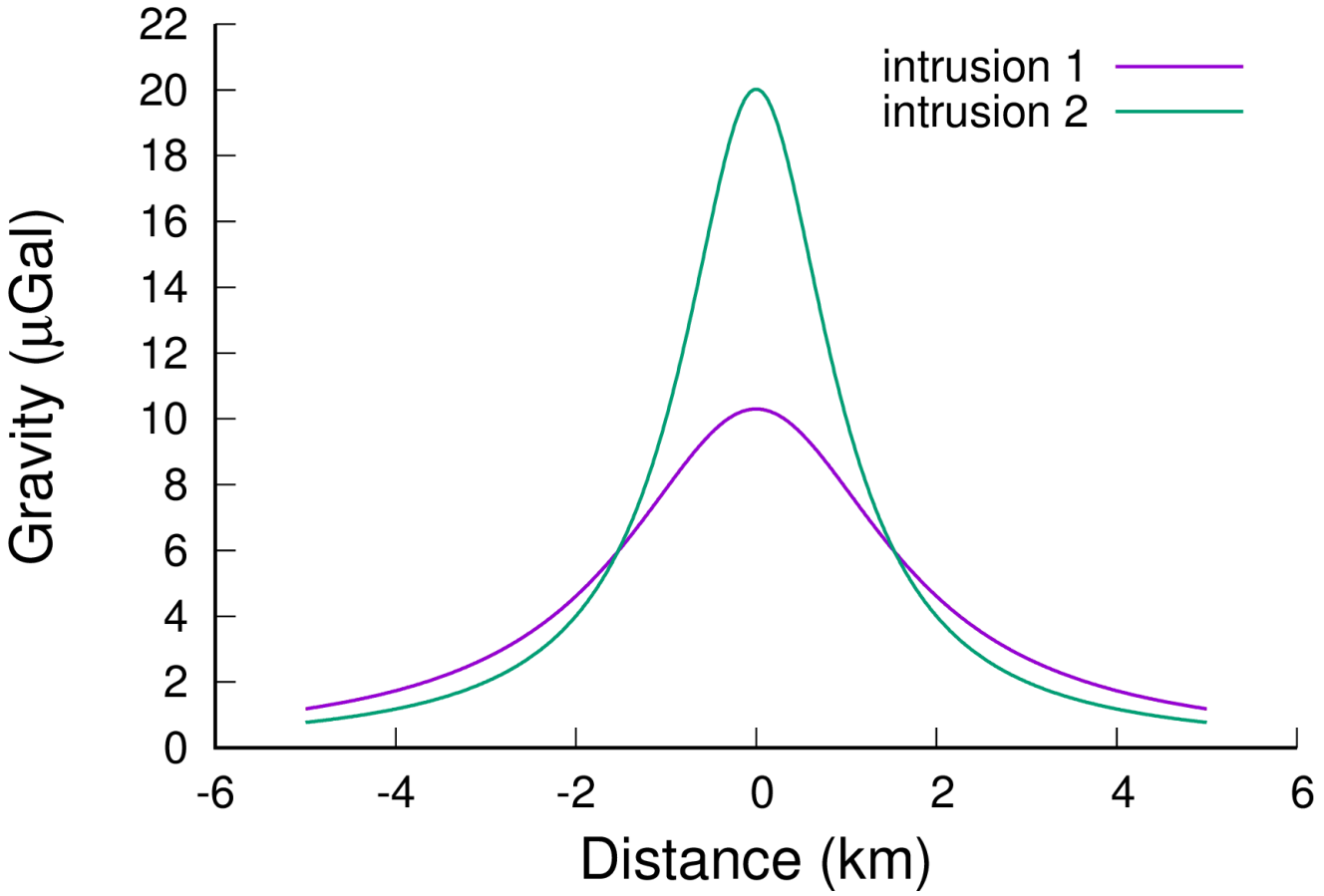
intrusion 2:
sub-vertical: dip = 67-70°
length: 1119 m / 1309 m
width: 1648 m / 1750 m
opening: 0.46 m / 0.51 m
volume: 848291.5 m3 / 1168282.5 m3
for a basalt density ranging: 2.7-3.2 (g/cm3)
TOTAL mass of intrusion 2:
2290.39 - 3738.5 10^6 kg



Objective of new points was to try to study the mass distribution directy underneath the surface of the last eruption.

These figures were prepared by Stephanie

Gravity should be able to discriminate between the two intrusion models



Gravity profile directly over the dyke intrusion

AL2: Eruption Dynamics

- No results yet to present for this objective.
- Hopefully our gravity observations inside the caldeira will detect the size and location of the mass intrusion which might be helpful for the study of the eruption dynamics.

AL3: Strategies for Risk Mitigation

- Not yet

Challenges/issues encountered/anticipated

- Not feasible to hire a donkey and observe gravity values outside the rim of the volcano to fill gap in field of observed gravity points.
- Observing gravity with uGal accuracy is challenging!
  - Longer GPS observation spans were used inside the caldeira to guarantee accurate heights.
  - Second base station in caldeira was used to reduce risk of jumps during trip between hotel/caldeira.
- Nevertheless, maybe a few more gravity observations inside the caldeira might be needed (we will know soon).

Plans for coming months

- Finalise analysis of last gravity campaign.
- Obtain DTM of Fogo from WP8 and compute accurate terrain corrections to subtract effect of topography on gravity observations.
- Obtain first prototype of seismic tomography model (WP6) to start to do some gravity inversion to create a density contrast model.