Towards reconciling seismic and geodetic moment estimations: Case Bárðarbunga

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Overview:

- Caldera collapse of Bárðarbunga 2014 - 2015
- Partial ring fault rupture as source model for biggest earthquakes
- Recalculation of seismic moment casts doubt on aseismic collapse?

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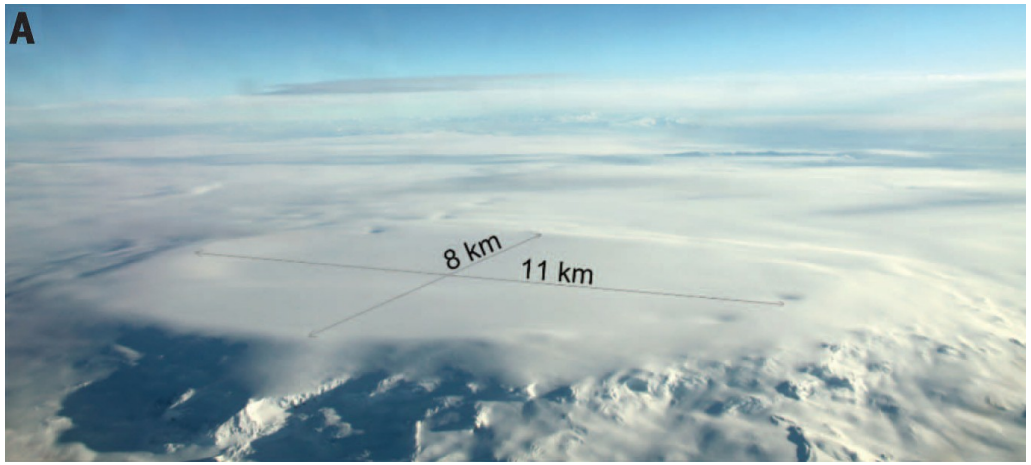
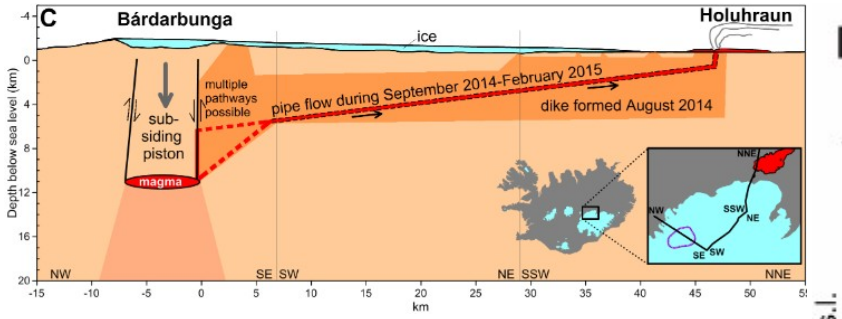
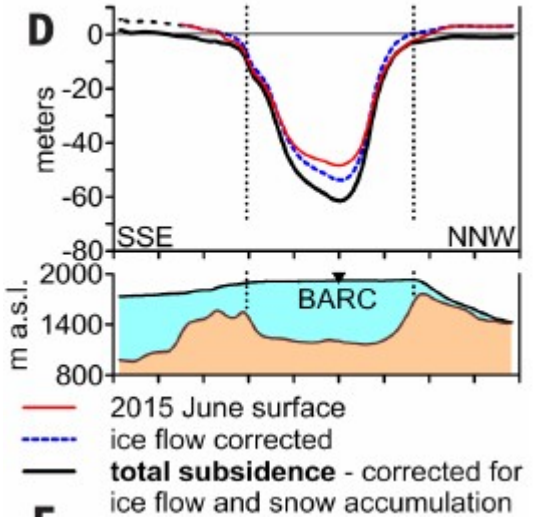
Bárðarbunga collapse 2014-2015

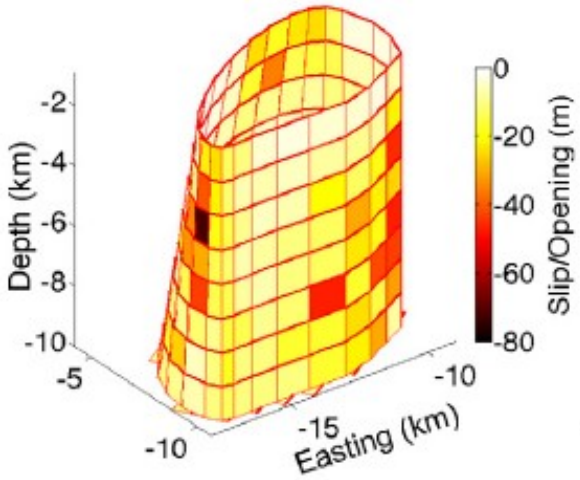




From Gudmundsson et. al. (2016)



	Gudmundsson et al., (2016)	Recalculations
Subsidence	60m	40m (Parks et al., 2017)
Height of fault	12km	6-7km (Agustsdottir et al, 2019)
Rigidity	2 – 20 GPa	10GPa (this study)
Seismic moment (Mo)	Planar rupture	Curved ruptures



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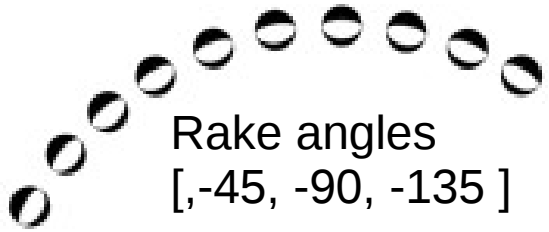
Source parameters of ring ruptures

- Larger seismic moment than planar sources produce the same seismic radiation : we calculate the correction factor
- MT dominated by ISOtropic. CLVD dominates deviatoric
- Tested 3 networks: Seismic moment → regional better

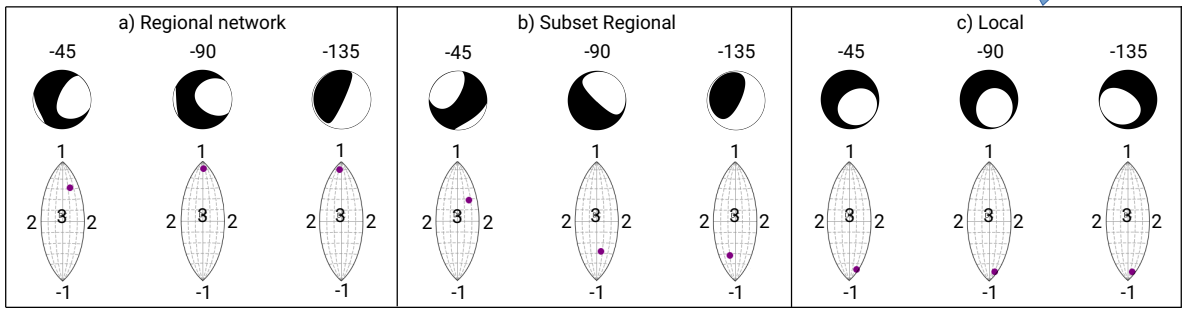
  MT estimation → local better

Rupture model



Rake angles
[,-45, -90, -135]

Rupture	Correction of Mo due to curvature
1/4	x2.93 larger
1/2	x3.68 larger
3/4	x7.75 larger
Full	x9.7 larger



Focal mechanisms: Deviatoric MT
Lune plot: full MT; 1 explosion, -1 implosion, 2 CLVD and 3 DC.

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Conclusion

- Assuming ruptures of 90° in NNW of caldera → correction factor ~3
- Seismic moment proposed by Gudmundsson et al, 5.07 x 10^{18} Nm, we recalculate (x3) to 1.5 x 10^{19} Nm
- Geodetic moment of 6.67 x 10^{19} Nm (recalculated by other studies)
  - Around 1/4 of the total strain energy is seismic.
- Slow earthquakes? Tremor? Lubrication of faults?
- Is $Mo = \mu A D$ valid for ring faults?

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