

Density reconstruction via Bayesian large-scale structure inference

Euclid GC SWG - Additional galaxy clustering probes

Florent Leclercq

www.florent-leclercq.eu

Imperial Centre for Inference and Cosmology
Imperial College London

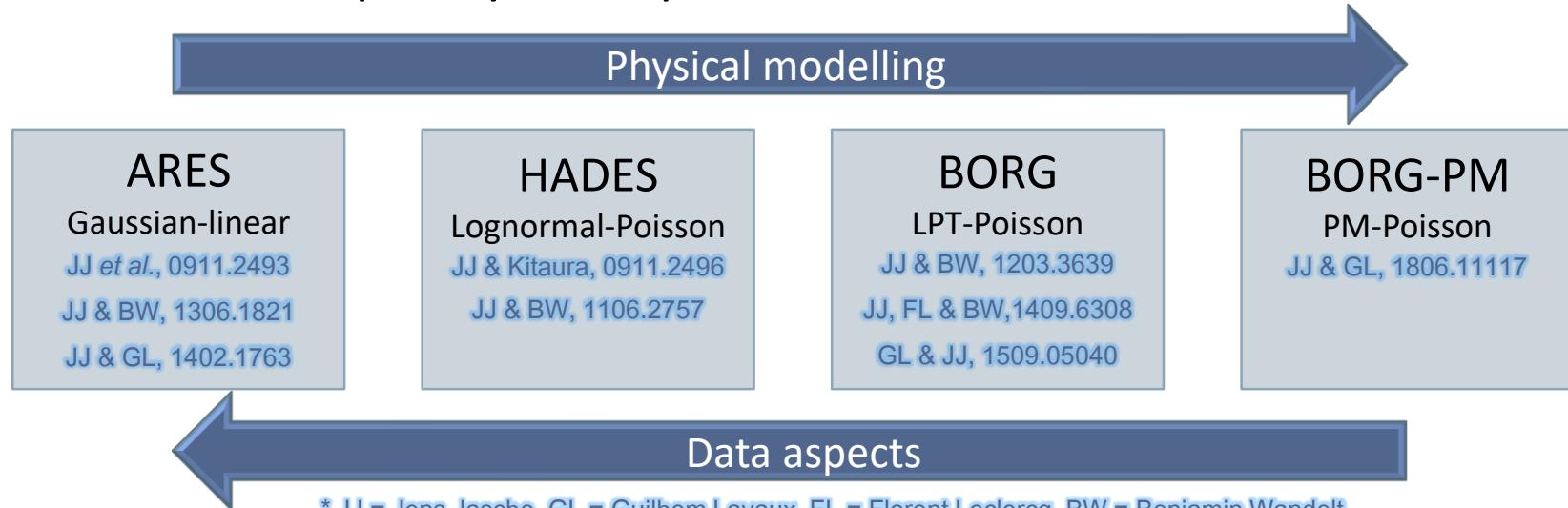


Participants: Jens Jasche, Guilhem Lavaux
(Aquila Consortium, www.aquila-consortium.org)
+ Pierros Ntelis, Hélène Courtois

June 5th, 2019

Bayesian large-scale structure inference codes

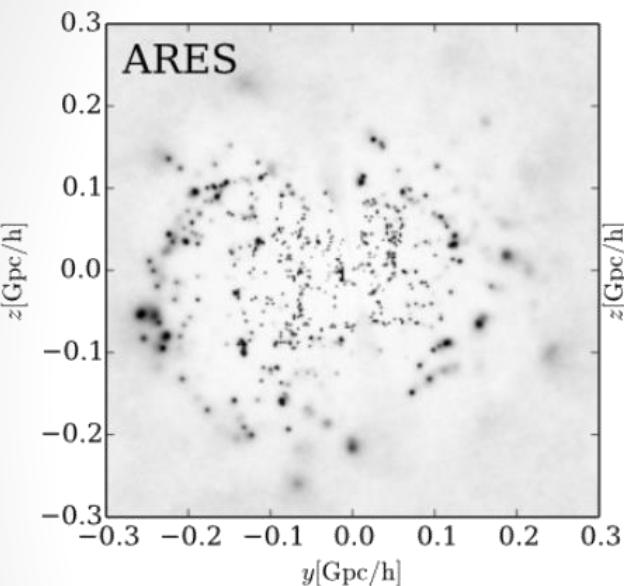
- Codes developed by the Aquila Consortium:



- Additional features:
 - Power spectrum inference
 - Galaxy bias (various models), redshift-space distortions, light-cone effects
 - Alcock-Paczyński effect and cosmological parameter inference
[Ramanah, Lavaux & Wandelt 2018, arXiv:1808.07496](#)
 - Foregrounds and treatment of unknown systematics
[Jasche & Lavaux 2017, arXiv:1706.08971](#) • [Porqueres, Ramanah, Jasche & Lavaux 2018, arXiv:1812.05113](#)

Comparing BLSS methods

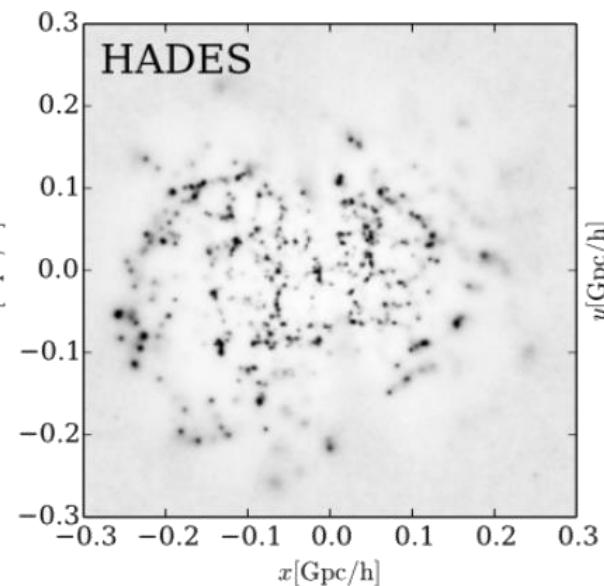
Gaussian (a.k.a. Wiener filter)



Jasche *et al.* 2010, arXiv:0911.2493

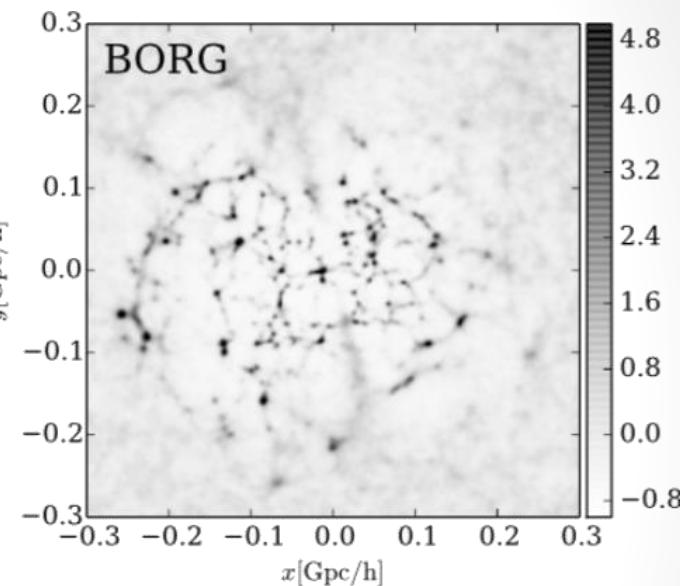
Jasche & Wandelt 2013, arXiv:1306.1821

Lognormal – Poisson



Jasche & Kitaura 2010,
arXiv:0911.2496

2LPT – Poisson



Jasche & Wandelt 2013,
arXiv:1203.3639

- Which scheme performs best? Ask the data!

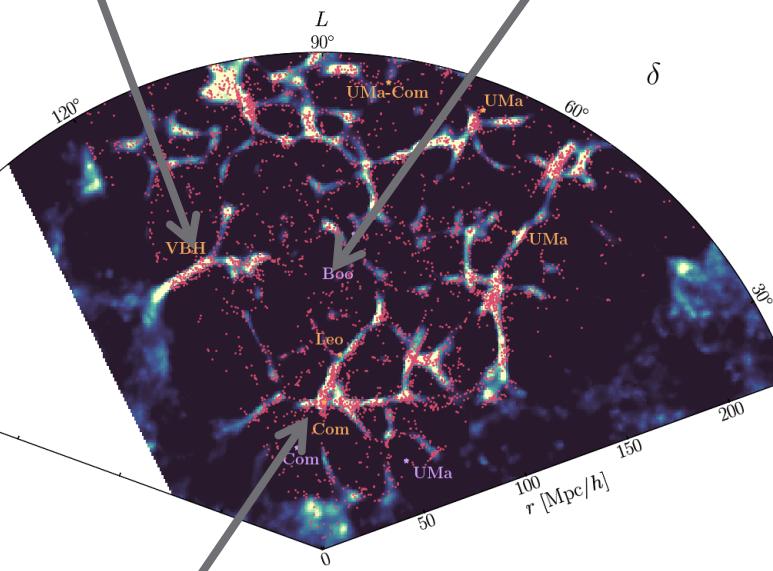
$$A_{ij} = \ln(\mathcal{P}(d|\delta_i)) - \ln(\mathcal{P}(d|\delta_j))$$

	ARES	HADES	BORG
ARES	0	-219580.31	-383482.25
HADES	219580.31	0	-163901.94
BORG	383482.25	163901.94	0.

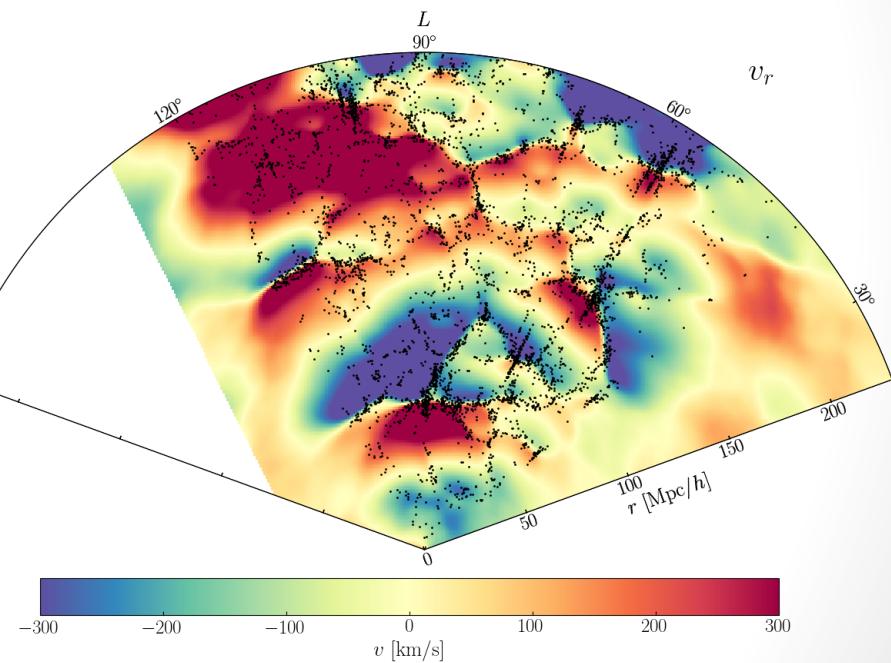
Cosmography in the supergalactic plane

Virgo-Boötes-
Hercules filament

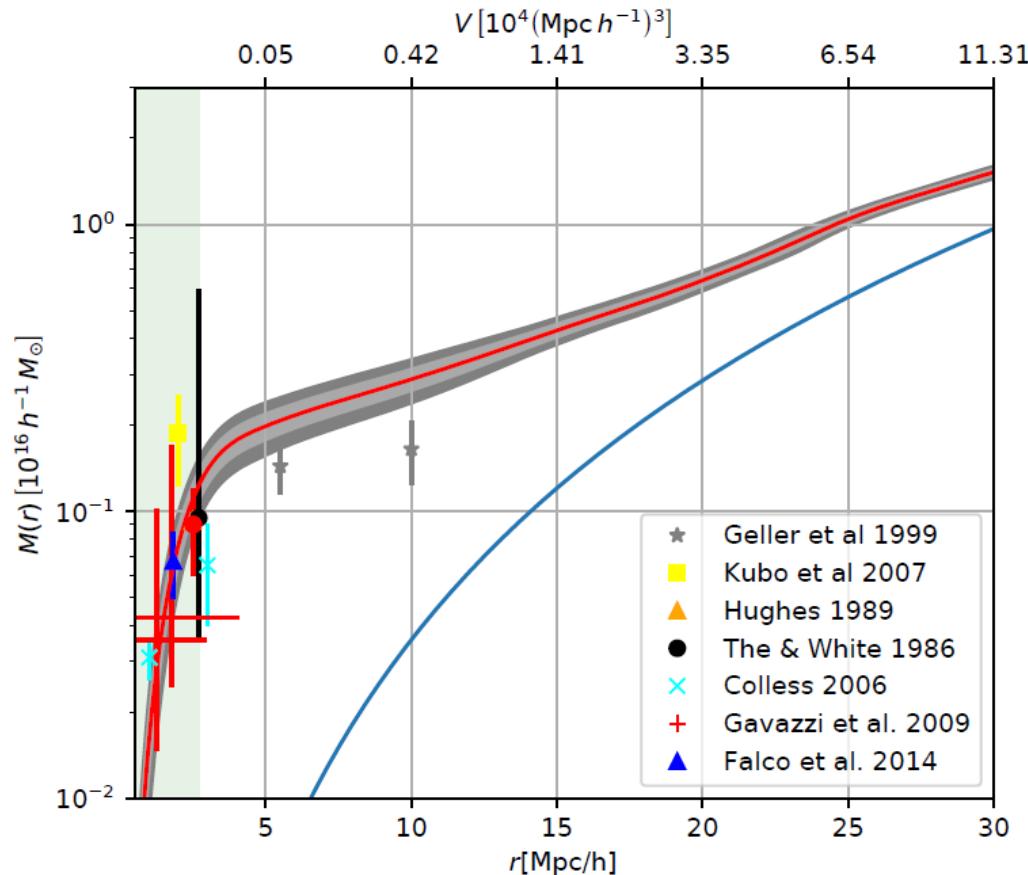
Boötes void



Coma cluster

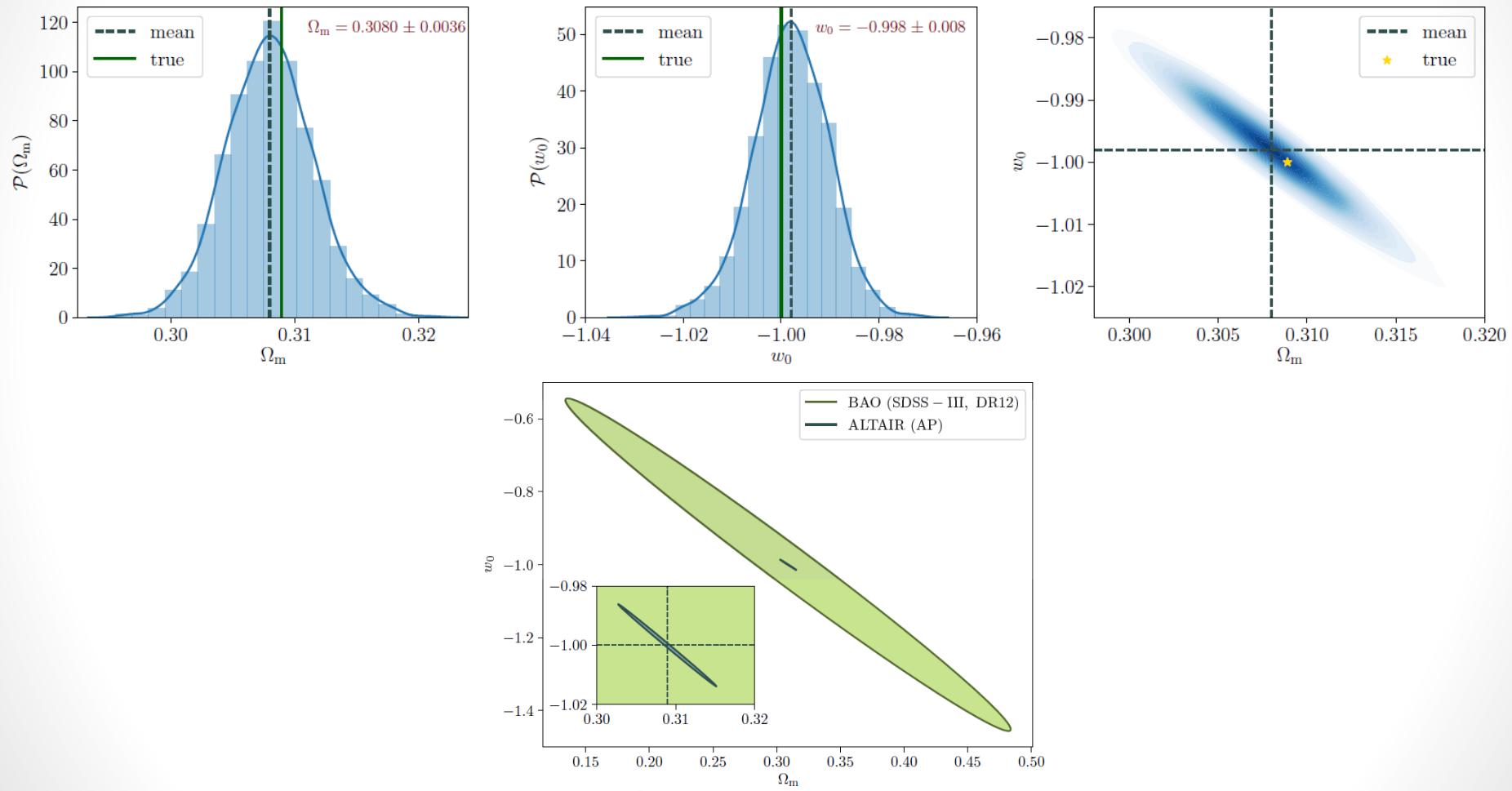


BORG-PM: full non-linear dynamics



Mass profile of the **Coma cluster**, in agreement with gravitational lensing and X-ray observations down to a few Mpc.

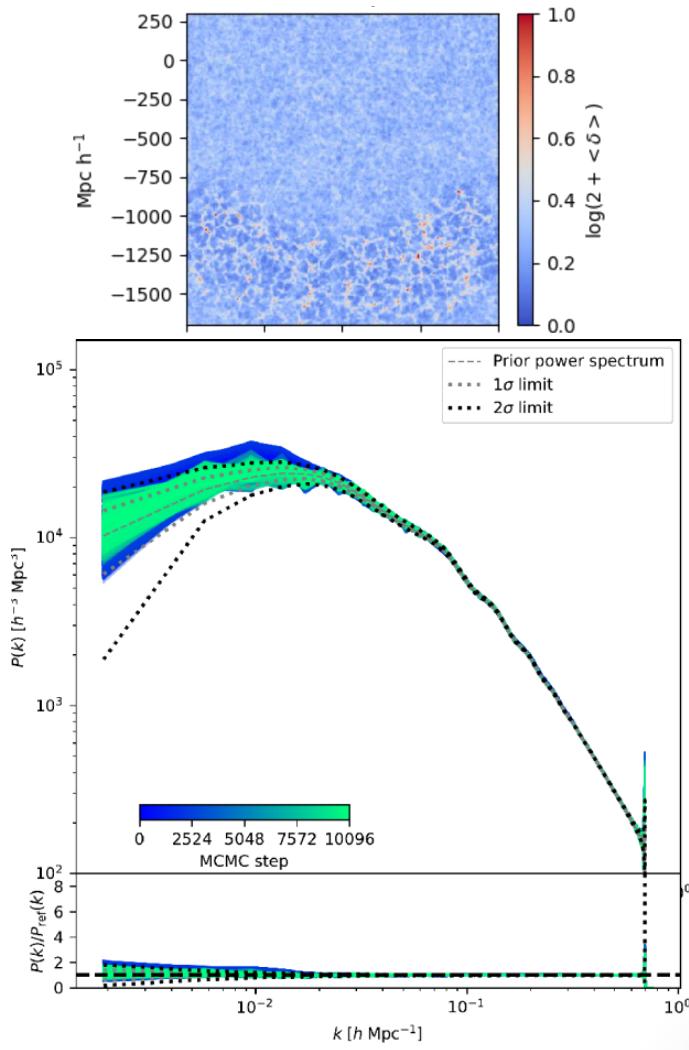
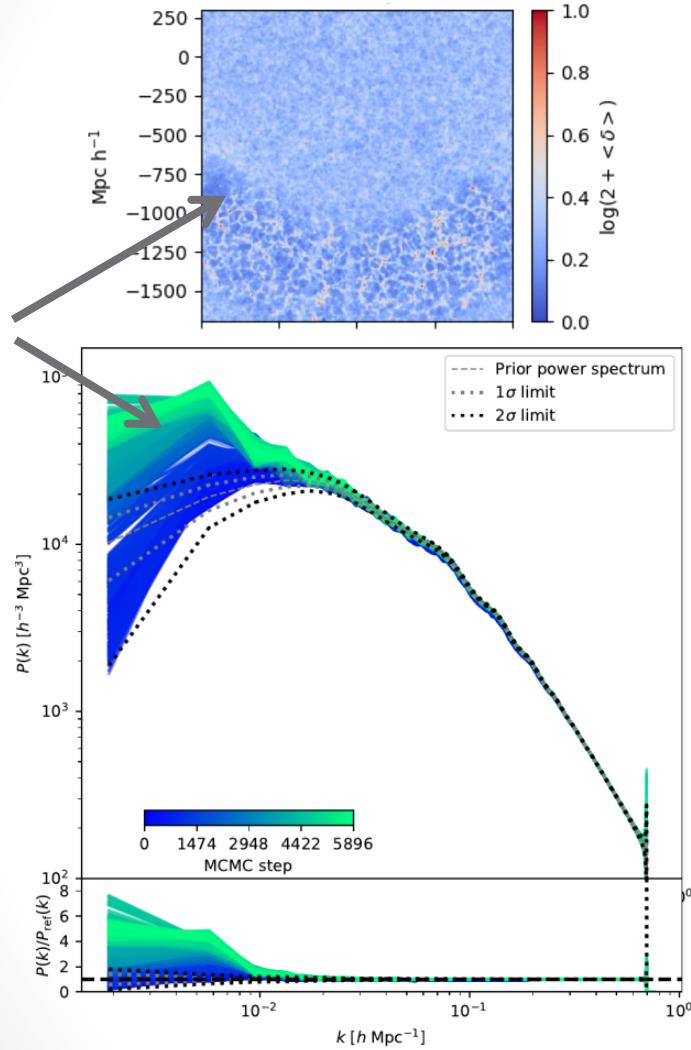
ALTAIR: Cosmological inference from AP effect



Joint map-cosmology inference is becoming feasible.

Ramanah, Lavaux & Wandelt 2018, arXiv:1808.07496

Unknown foreground contaminations



Porqueres, Ramanah, Jasche & Lavaux 2018, arXiv:1812.05113

Conclusions

- Bayesian large-scale structure inference is not an impossible task!
- On-going work in the GC SWG – WP “Additional probes” & TH SWG – WP “Initial Conditions”
- The future: great science and challenges

