EUROEXA
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A web interface for large, cosmological hydrodynamical simulations

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http://c2papcosmosim.lrz.de

LMU USM lrz CAST Computational Astrophysics Group Munich University Observatory IMPRS

MAGNETICUM CAST C2PAP

Project ID: 754337

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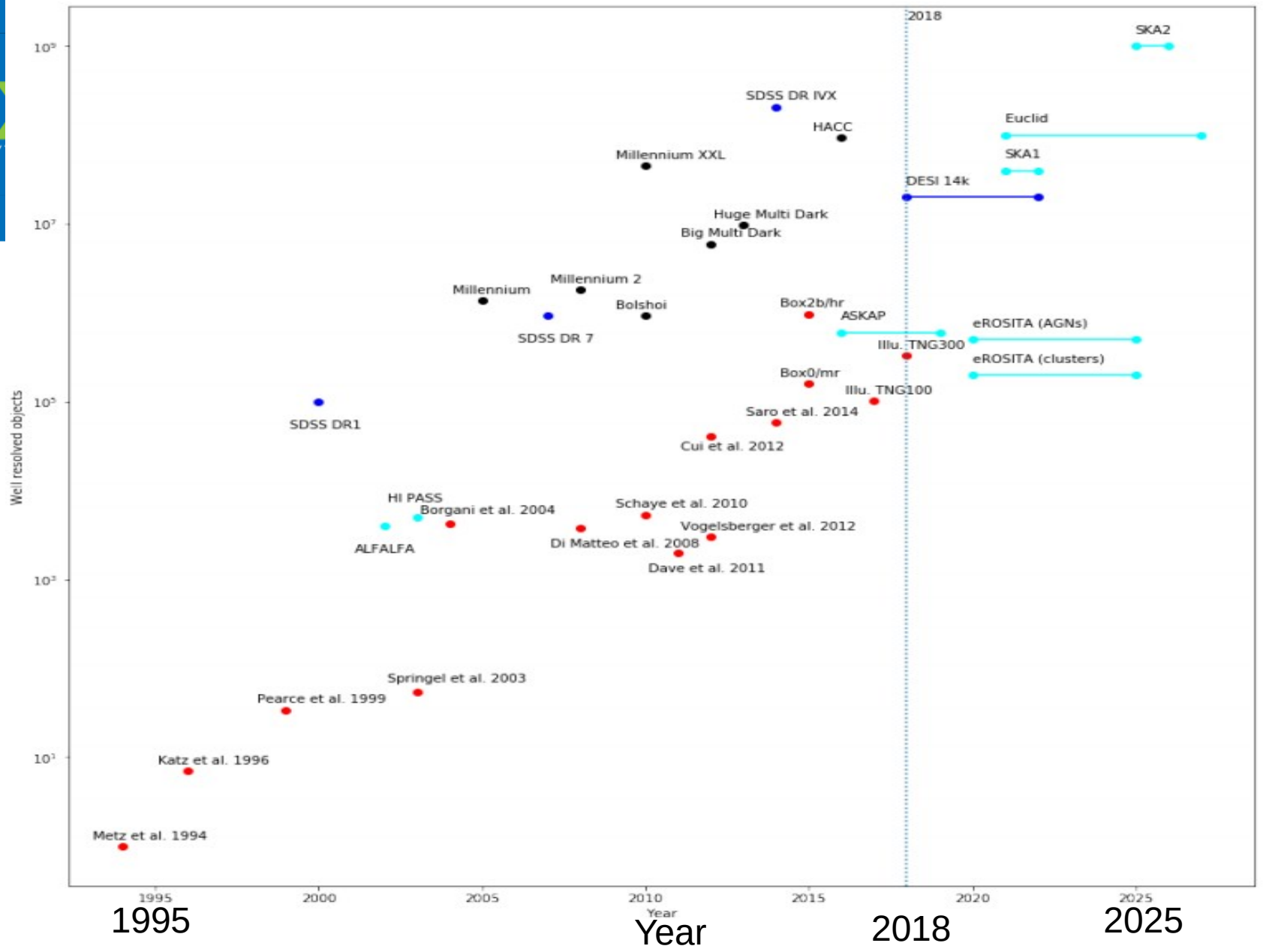

Number of well resolved objects

1995 Year 2018 2025

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Modern Cosmological Hydrodynamic Simulations

- N-body simulations: dark matter, gas and stars content sampled with particles
- Follow up to 4Gpc of volume from z=100 to z=0
- Samples up to 10^11 particles
- Takes millions of CPUh (wall clock time x number of CPUs)

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Magneticum Simulations

Magneticum Pathfinder & Magneticum

	Box0	Box1	Box2b	Box2	Box3	Box4	Box5
[Mpc/h]	2688	896	640	352	128	48	18
mr	$2*4536^3$	$2*1526^3$		$2*594^3$	$2*216^3$	$2*81^3$	
hr			$2*2880^3$	$2*1584^3$	$2*576^3$	$2*216^3$	$2*81^3$
uhr					$2*1536^3$	$2*576^3$	$2*216^3$
xhr						$2*1536^3$	$2*576^3$

Table 1: Number of particles used in the *Magneticum Pathfinder* and *Magneticum* simulations for the different resolution levels *mr*, *hr*, *uhr* and *xhr*. The red entries mark simulations which are currently running or not ran to z=0, the gray entries mark future, planned simulations.

	m_{dm}	m_{gas}	eps_{dm}	eps_{gas}	eps_{stars}
mr	1.3e10	2.6e9	10	10	5
hr	6.9e8	1.4e8	3.75	3.75	2
uhr	3.6e7	7.3e6	1.4	1.4	0.7
xhr	1.9e6	3.9e5	0.45	0.45	0.25

Table 2: Mass of dm and gas particles (in Msol/h) at the different resolution levels and the according softenings (in kpc/h) used.

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Data From Cosmological Simulations

- Raw data: for every time slice the list of all particles and their properties is saved

- Post processed metadata: some algorithms (friend-of-friend, or SUBFIND) will identify haloes and galaxy members in the raw data.

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Amount of Data

Magneticum/Box2b/hr (PI: Klaus Dolag, see Hirschmann et al 2015):

- particles: 2x2880^3 ~ 5e10
- simulated volume: 640.0 Mpc/h
- around 50000 galaxy clusters each with 10-100 galaxies
- around 1TB of raw data and 51GB metadata per timeslice

Magneticum/Box0/mr (PI: Klaus Dolag):

- around 20TB of raw data and 500GB metadata per timeslice

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Challenges

- Lack of HPC knowledge from people who uses sims → analyses are inefficient (e.g. find an “interesting” galaxy cluster)
- Not possible to copy/move the results: data must be stored in HPC facility → not possible to make data publicly avaiable

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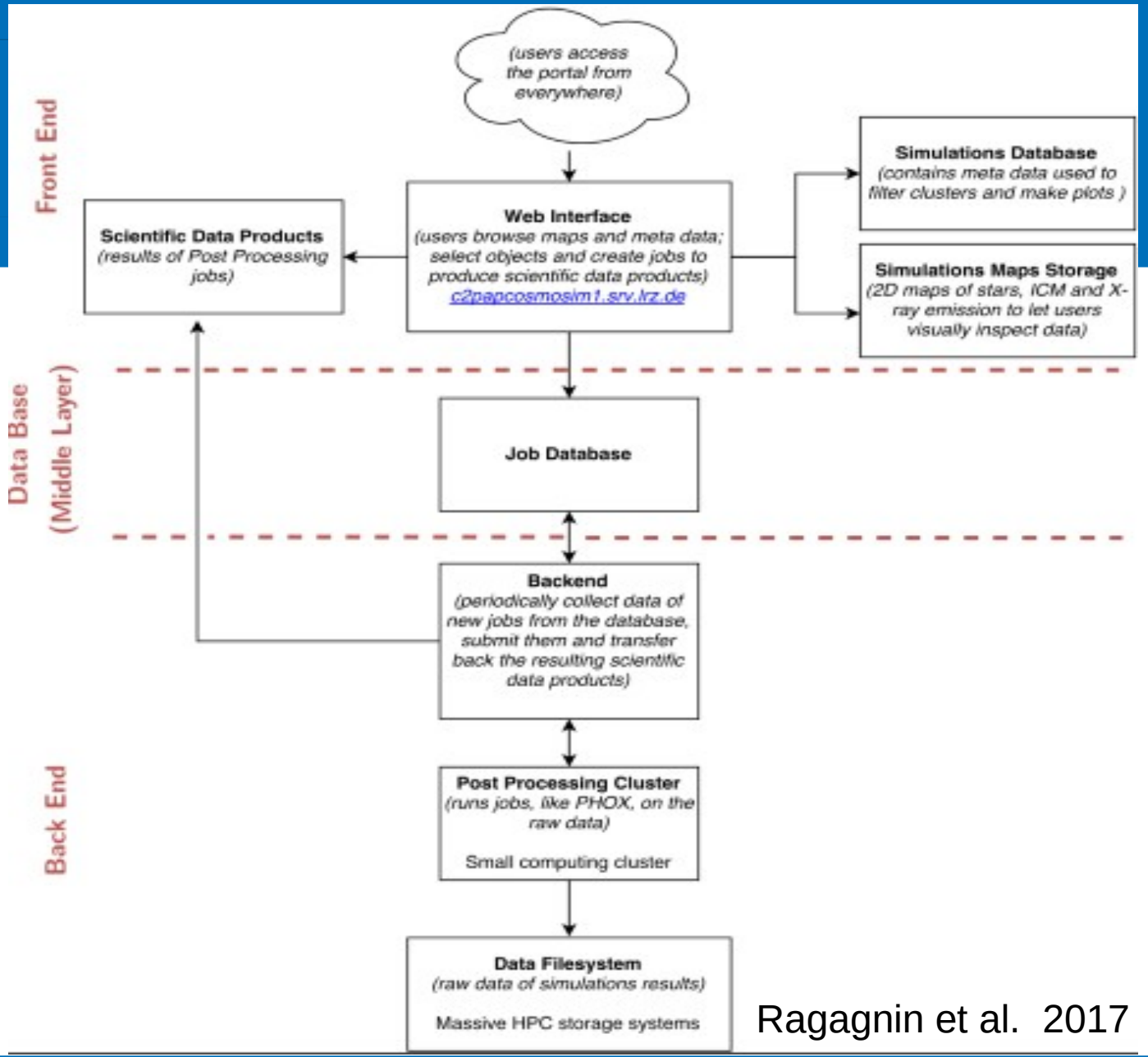

Ragagnin et al. 2017

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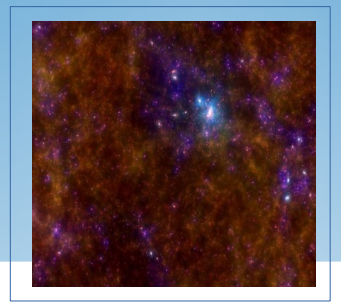
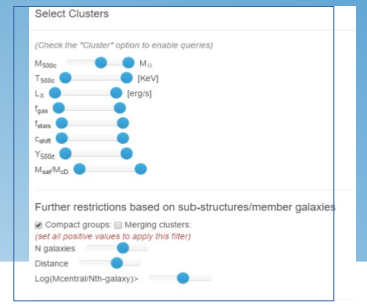
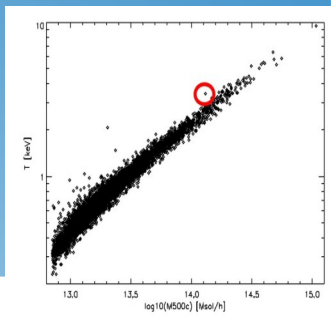
1) Three different ways To find an object

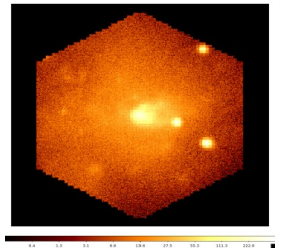


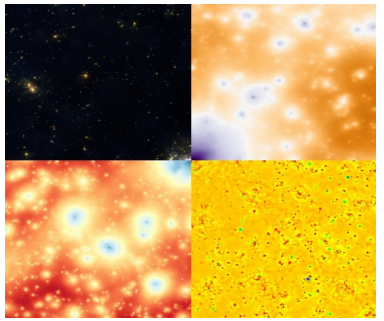




2) Execute a job over the raw-data on the given Cluster

- Extract particles
- PHOX Virtual X -ray Observatory,
- 2D MAPS





3) Download results when job finished

http://c2papcosmosim.srv.lrz.de

Demo

Demo? At the time I am writing I am not sure I will have a good internet access

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Many Thanks
Please Connect at
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