

*Julian Merten*

*Abell 2744: A New Bullet ... and more*

Institut für Theoretische Astrophysik  
Zentrum für Astronomie  
Universität Heidelberg

October 28<sup>th</sup>, 2010



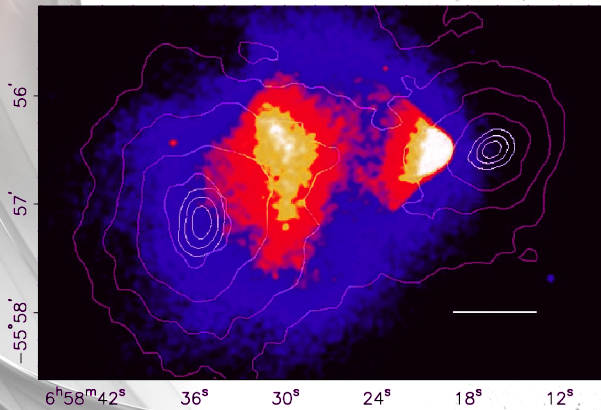
*Two ways of doing cosmology with clusters*



*Two ways of doing cosmology with clusters*



# *A gallery*

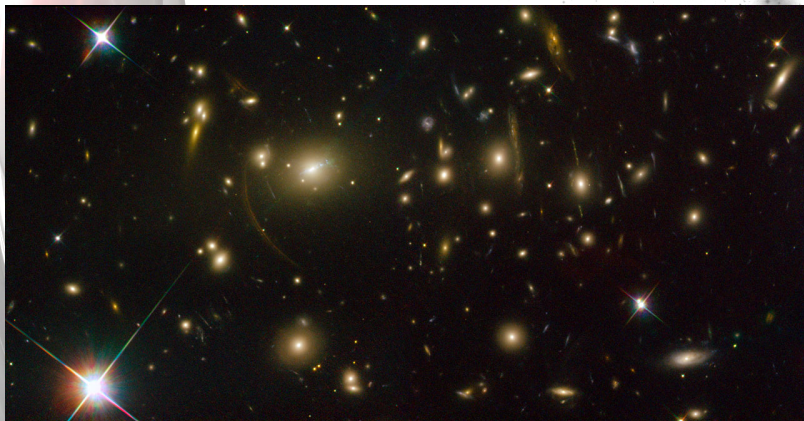




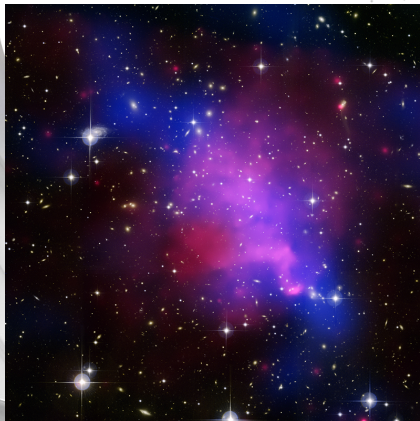
*A gallery*



*A gallery*



*A gallery*



# *Abell 2744: Investigators*

## *United States*

- R. A. Dupcke (ACS P.I.) (Michigan)
- J. Krick (Caltech)
- J. N. Bregman (Michigan)
- D. Coe (VLT P.I.) (Caltech/JPL)
- R. A. Bernstein (Santa Cruz)
- L. Moustakas (JPL)
- B. Frye (UC San Francisco)

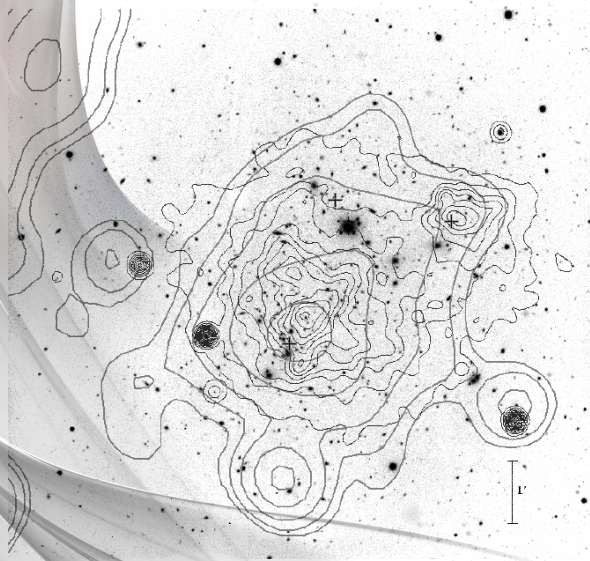
## *Europe*

- N. Benitez (Granada)
- T. Broadhurst (Bilbao)
- R. Massey (Edinburgh)
- J. Merten (Heidelberg)
- R. A. Bernstein (Santa Cruz)
- M. Meneghetti (Bologna)
- Y. Jimenez Teja (Granada)

## *The rest of the world*

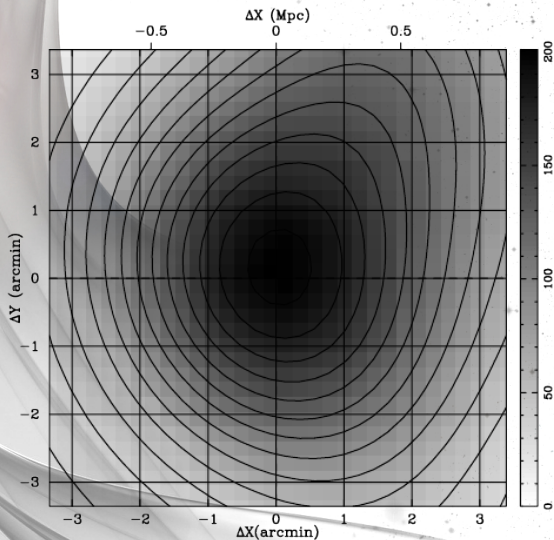
- L. Sodre (Sao Paolo)
- E. Cypriano (Sao Paolo)
- A. Zitrin (Tel Aviv)
- F. Braglia (Vancouver)

*Abell 2744: As seen so far*



(Govoni01+, Boschin06+, Braglia08+, Kempner04+)

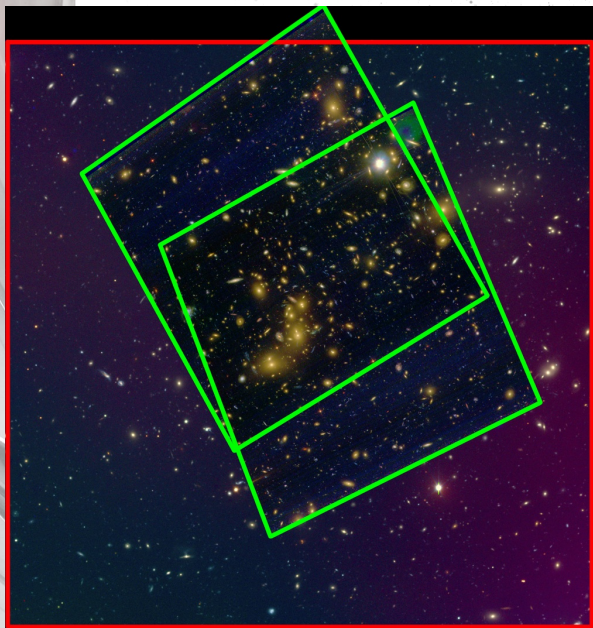
# Abell 2744: As seen so far



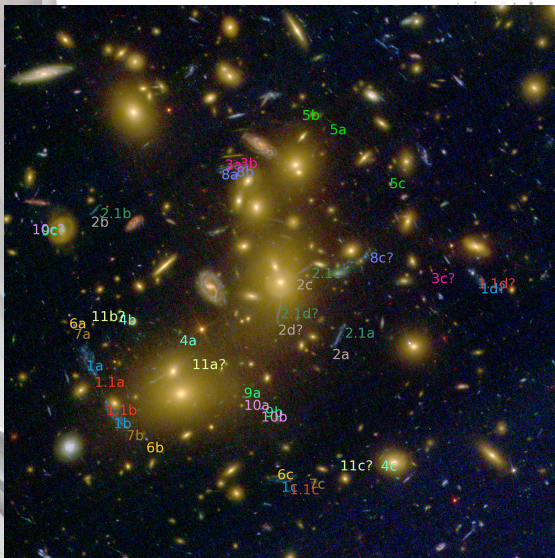
(Cypriano04+)



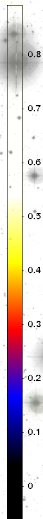
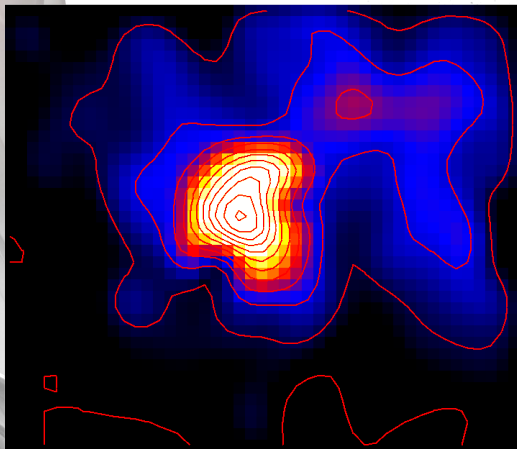
# Abell 2744: Dataset



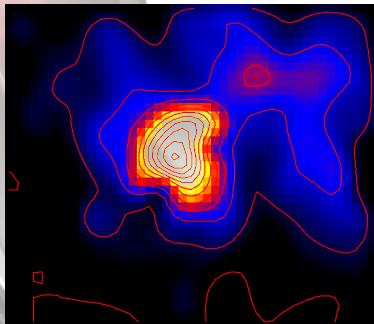
# First results



*First results*

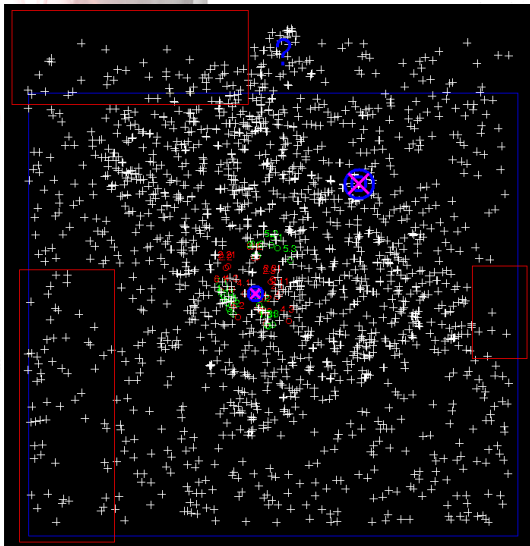


## Abell 2744: Issues



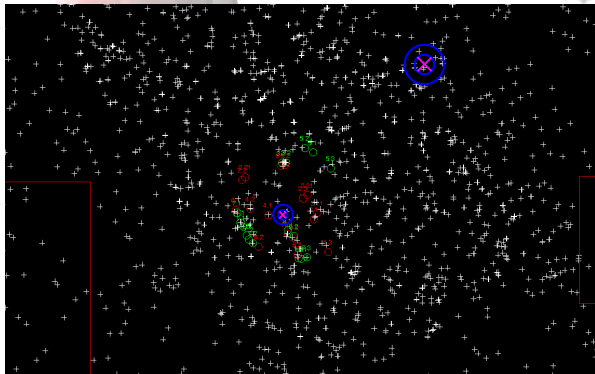
- Strong lensing of the NW peak?

## Abell 2744: Issues



- Strong lensing of the NW peak?
- Low resolution in the outskirts  
⇒ SUBARU imaging

## Abell 2744: Issues

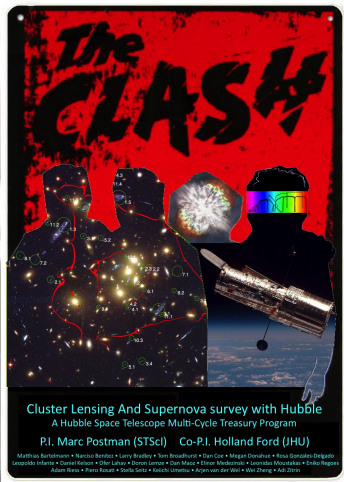


- Strong lensing of the NW peak?
- Low resolution in the outskirts  
⇒ SUBARU imaging
- Strong lensing redshifts  
⇒ VLT spectroscopy



# CLASH

One of three HST/MCT programmes. Start September 2010 (3 cycles).



The CLASH logo is prominently displayed at the top in a stylized, jagged font against a red, starry background. Below the logo, there are three circular inset images: a galaxy cluster with red lensing contours, a supernova, and the Hubble Space Telescope. The main background of the poster shows a field of galaxies with red lensing contours and various numerical labels (e.g., 112, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200).

Cluster Lensing And Supernova survey with Hubble  
A Hubble Space Telescope Multi-Cycle Treasury Program

P.I. Marc Postman (STScI) Co-P.I. Holland Ford (JHU)

Matthias Bartelmann • Narciso Benítez • Larry Bradley • Tom Broadhurst • Dan Cox • Megan Donahue • Ross D’Agostino  
Luca Di Stefano • Daniel Kelson • Ofer Lahav • Doron Levor • Dan Maoz • Elinor Mouchinsky • Leonidas Moustakas • Endre Regös  
Adam Riess • Piero Rosati • Stella Seitz • Kailich Umetsu • Arjan van der Wal • Wei Zheng • Adi Zitrin

## Science Drivers

- To map the dark matter in galaxy clusters
- To detect SN out to redshifts  $z > 1.5$
- To detect and characterise  $z > 7$  galaxies
- To study the galaxies in and behind the clusters

<http://www.stsci.edu/~postman/CLASH/>

# *CLASH: Investigators*

## *United States*

M. Postman (P.I.) (STScI)	H. Ford (Co-P.I.) (JHU)	L. Bradley (STScI)	D. Coe (STScI)
M. Donahue (Michigan)	G. Graves (UC Berkeley)	D. Kelson (Carnegie)	D. Lemze (JHU)
E. Medezinski (JHU)	L. Moustakas (JPL)	A. Riess (STScI/JHU)	W. Zheng (JHU)

## *Europe*

M. Bartelmann (Heidelberg)	N. Benitez (Granada)	R. Bouwens (Leiden)	T. Broadhurst (Bilbao)
R. Gonzales-Delgado (Granada)	O. Host (London)	S. Jouvel (London)	O. Lahav (London)
R. Lazkoz (Bilbao)	P. Melchior (Heidelberg)	M. Meneghetti (Bologna)	J. Merten (Heidelberg)
E. Regos (CERN)	P. Rosati (ESO)	S. Seitz (Munich)	

## *The rest of the world*

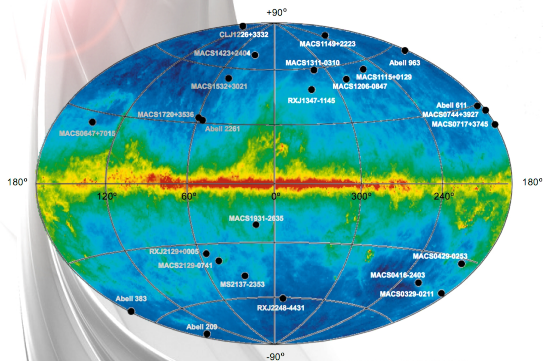
L. Infante (Santiago de Chile)	D. Maoz (Tel Aviv)	K. Umetsu (Taipei)	A. Zitrin (Tel Aviv)
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## *CLASH: Investigators*



Granada, September 20<sup>th</sup>, 2010

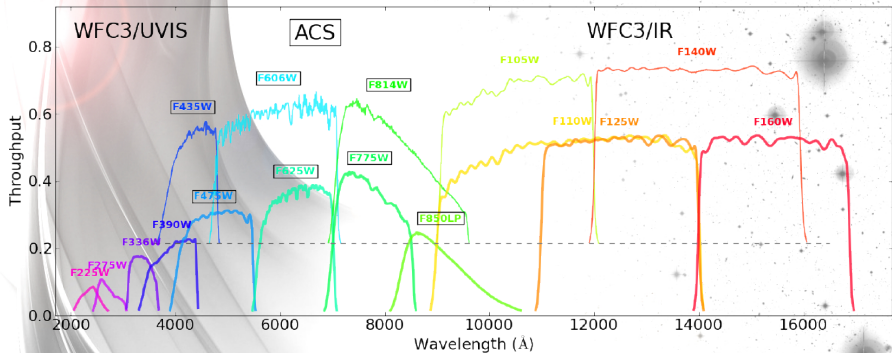
# CLASH: Targets



CLASH CLUSTER SAMPLE  
(Galactic Coordinates)

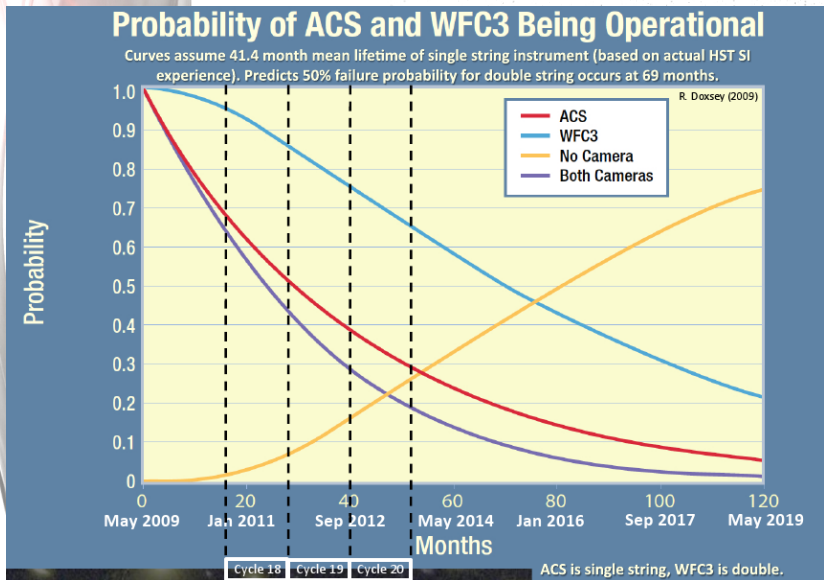
- 25 Clusters
- $0.18 < z < 0.9$
- X-ray selected
- relaxed
- Chandra archival data

# CLASH: HST observations



- ACS/WFC3 in parallel
- 524 orbits
- excellent photo-z determination
- near IR - near UV
- 20 orbits / cluster
- BPZ & LePhare (Hildebrandt10+)

# CLASH: HST observations

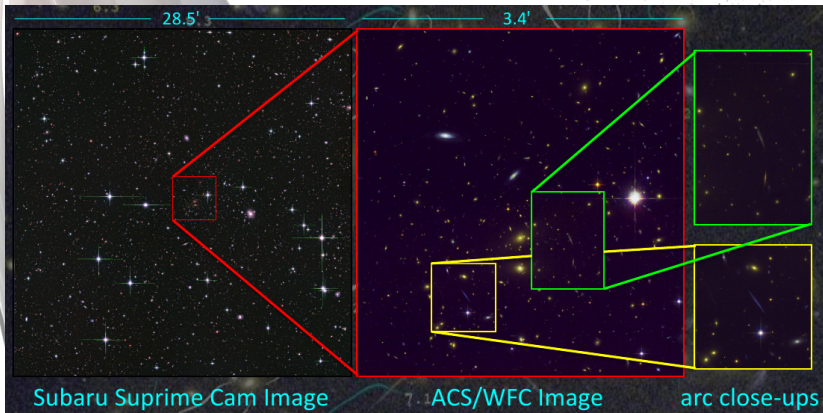




## *CLASH: Parallel data*

Nice sideremark: Granted Ground-based and CLASH-related observing time exceeds already the HST/MCT programme.

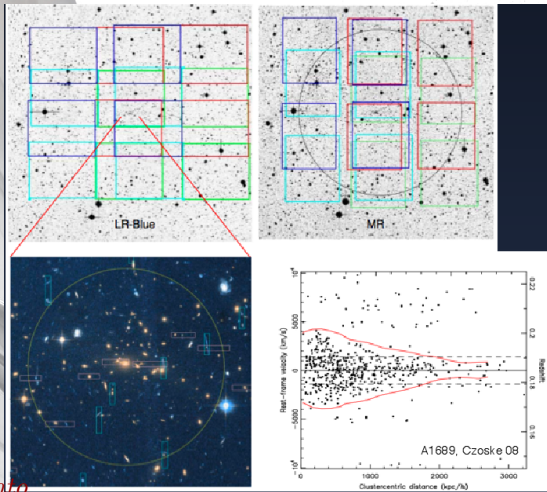
### SUBARU BVRIZ weak lensing



## CLASH: Parallel data

Nice sideremark: Granted Ground-based and CLASH-related observing time exceeds already the HST/MCT programme.

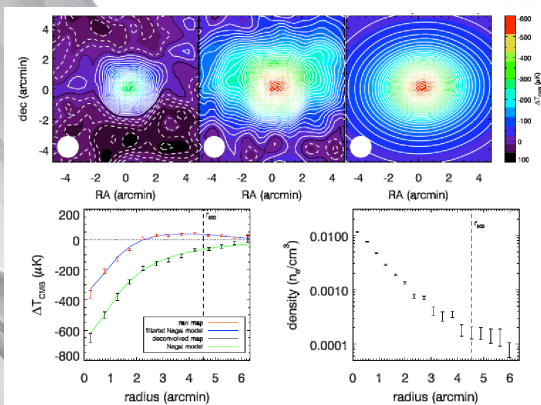
### GTC/VLT/Magellan spectroscopy



## CLASH: Parallel data

Nice sideremark: Granted Ground-based and CLASH-related observing time exceeds already the HST/MCT programme.

Bolocam/AMiBA/SZA/Mustang SZE observations



## *CLASH: Parallel data*

Nice sideremark: Granted Ground-based and CLASH-related observing time exceeds already the HST/MCT programme.

Chandra/XMM Newton archival data



## *CLASH in Heidelberg and Bologna*

- 1 Perform realistic, CLASH-like simulations to test and calibrate the methods (Massimo M.)
- 2 Measure shear and flexion in the HST and SUBARU frames (Peter, Massimo V.)
- 3 Reconstruct the mass profiles with a joint method
- 4 Make this all run on your PlayStation
- 5 Do cosmology with this (Matthias... "and his team")