ASTRODEEP

Unveiling the power of the deepest images of the Universe



Adriano Fontana (INAF)
James Dunlop (UEDIN)
David Elbaz (CEA)
Sebastien Derriere (CNRS)
+ Team of US collaborators

Agenda

V05 – 20150520

9:30 – 10:00	ASTRODEEP: where we stand	*A. Fontana*
10:00 – 10:30	WP5 Science : General overview	*J. Dunlop*
10:30 – 10:45	WP5 Science : Multiwavelength galaxy decomposition	*V. Bruce*
10:45 – 11:00	***Coffee break***	
11:00 – 11:15	WP3 Software tools: General overview	*D. Elbaz*
11:15 – 11:30	WP3 Software tools: T-PHOT	*E. Merlin*
11:30 – 11:45	WP3 Software tools: The incremental solution for HERSCHEL	*T. Wang*
11:45 – 12:05	WP4 Catalogs: General overview (includes WP6)	*A. Fontana*
12:05 – 12:20	WP7 Outreach: The CDS interface	*S. Derriere*
12:20 – 12:30	WP7 Outreach: Web site & Dissemination	*K. Boutsia*
12:30 – 14:00	***Lunch break***	
14:00 – 14:30	Project Management; use of resources; Budget (Status and forecasts)	*A. Fontana*
14:30 – 15:30	Internal meeting between PO and reviewer	
15:30 – 16:30	Preliminary feedback; conclusions from the reviewers	
16:30	***End of meeting***	

Outline

1) The scientific and international context (aka: why ASTRODEEP)
2) ASTRODEEP: the project
3) Main results in Period#2: where are we now?
4) Plan to the end of the project.

Outline

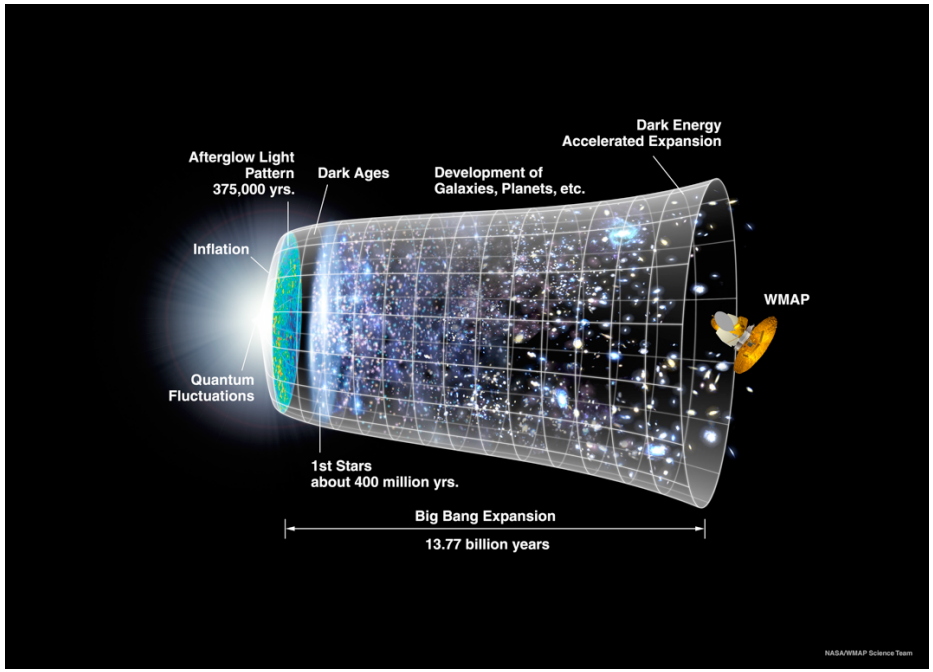
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ASTRODEEP

SEVENTH FRAMEWORK PROGRAMME

ASTRODEEP

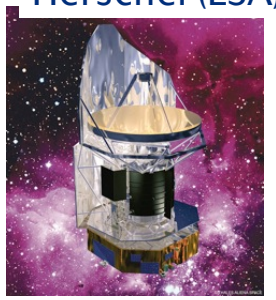
Scientific aim: to study the birth and early phase of galaxy evolution.



- When did first stars and galaxies appear?
- How did galaxies build up and assembled?
- Which are the main physical processes involved?

Methodology: concentrate all the major telescope from space and ground on few selected regions of the sky and observe as long (=as far) as possible

Herschel (ESA)





XMM (ESA)



Spitzer (NASA)

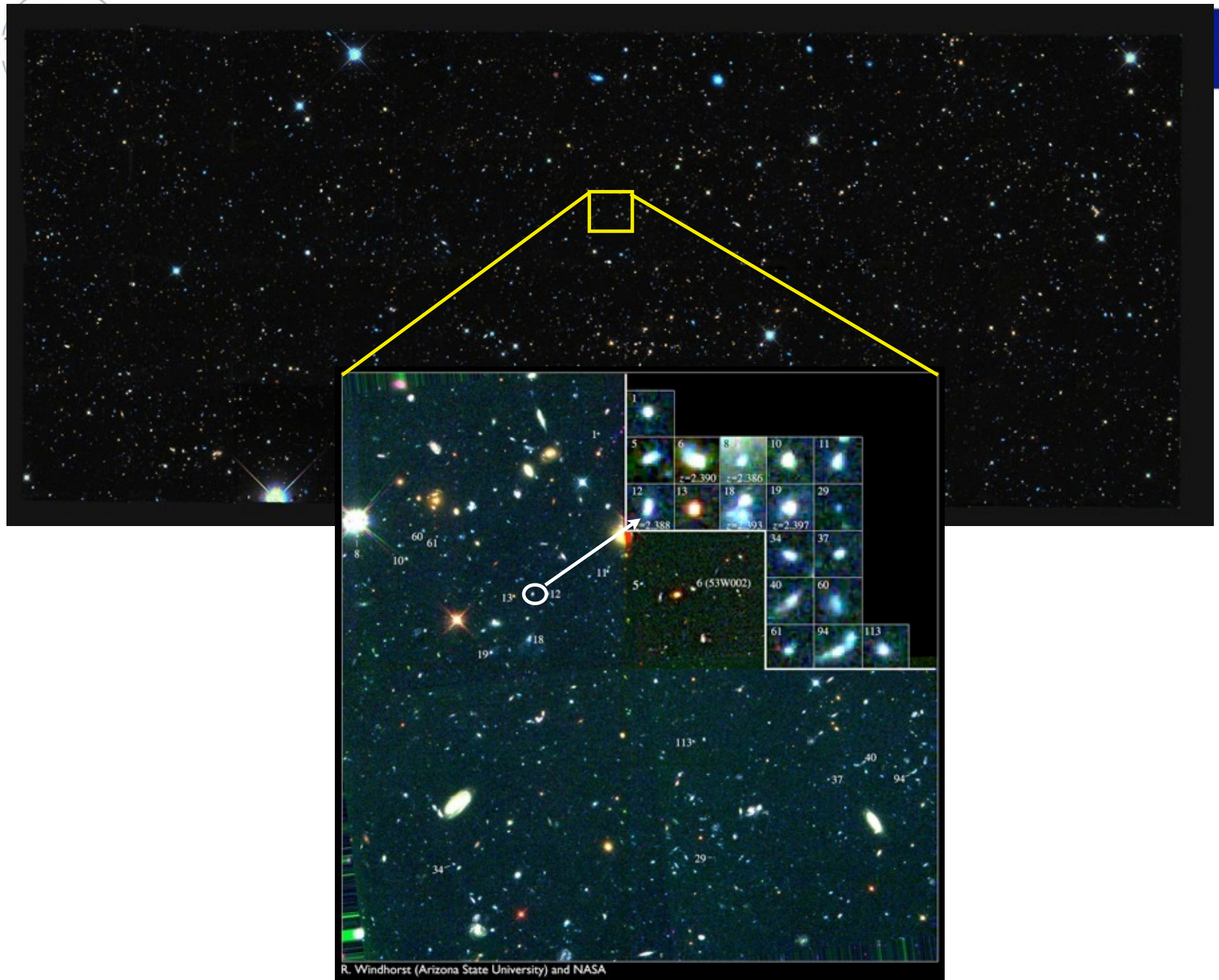


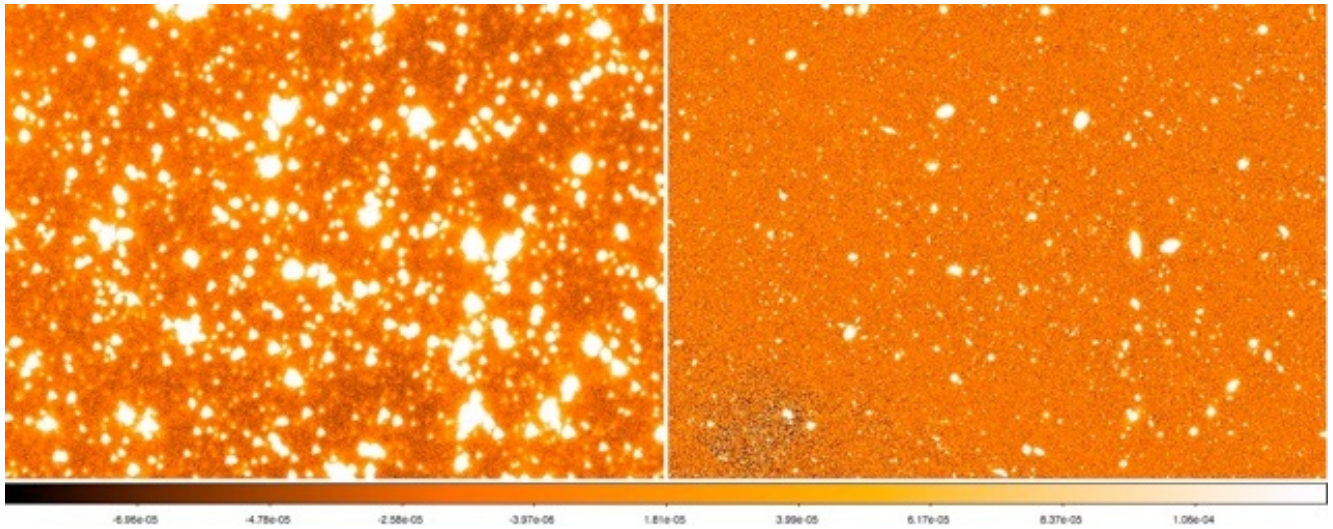
Hubble Space Telescope (NASA +ESA)



VLT (ESO)

These efforts are beyond the capacity of any single groups: PUBLIC SURVEYS


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R. Windhorst (Arizona State University) and NASA



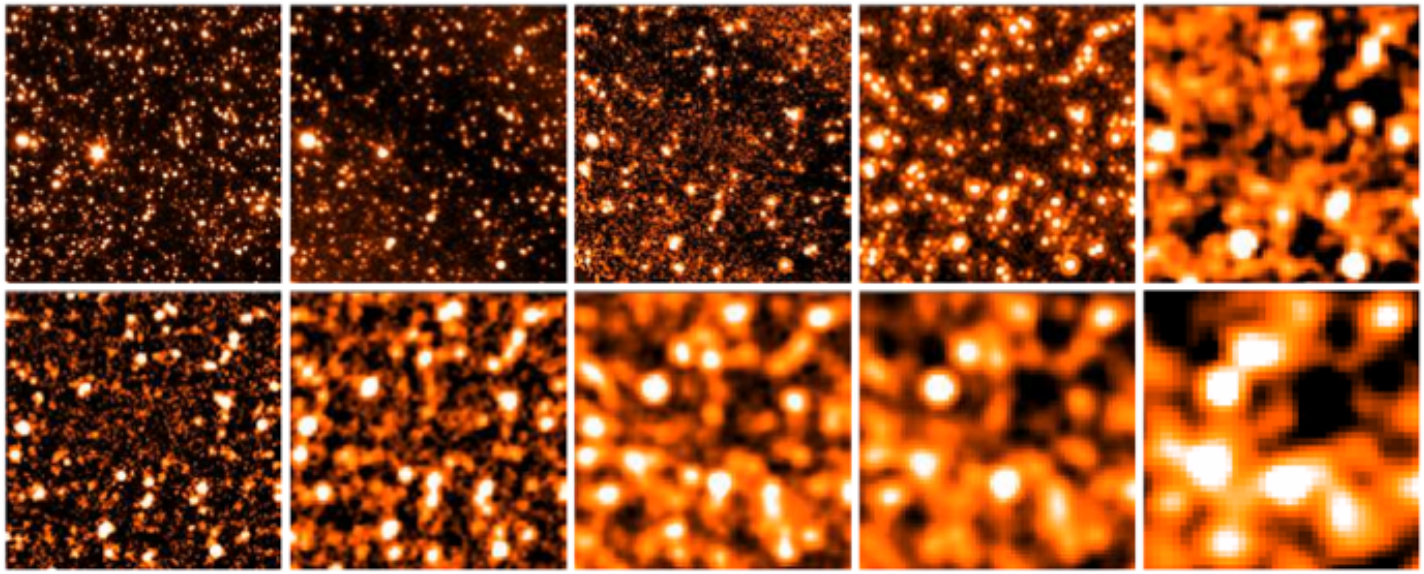
Public surveys delivers processed “clean” images that are not yet usable for science.
Need to be translated into catalogs.
This task:

- is time consuming / expensive: a bottleneck that hampers full scientific exploitation of the data;
- is still subject to considerable uncertainties: it presents conceptual challenges that need to be addressed
- the most obvious challenge is coping with different resolution: “confusion” is the enemy..

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1 Develop and fully validate new tools for data analysis of ultradeep surveys;



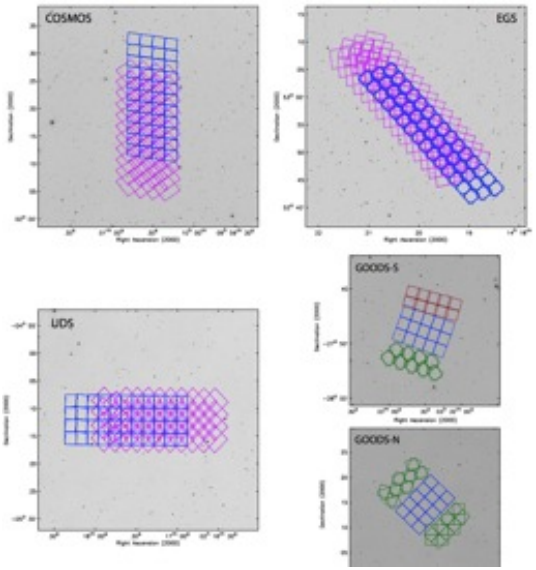
The key unresolved problem is how to cope with the different resolution and depth of the various datasets.
Several solutions have been proposed but never fully explored and characterized.

One of the ASTRODEEP goal is to fully characterize the different approaches and to develop state-of-the-art software that implements them.
Deliverables:
- Scientific publications
- Software will be publicly distributed.

2 Analyze all data from public surveys in a coherent and well characterized way

The data that are the subject of ASTRODEEP covers only 1/1,000,000 of the sky but are the result of the largest programs ever executed on major telescopes from space and ground.

We will focus on the 5 key extra-galactic survey fields, the target of public observing programs.
They include data from space, notably from HST, XMM, Herschel and Spitzer, and from several optical and far-IR ground based facilities.



Most of the data have already been obtain in recent years
They are the result of a miscellanea of programs from several groups
All the data are public
The ASTRODEEP leaders (including US team) are involved in all these surveys -> we have direct access to data and analysis tools

3 To deliver the final catalogs to the worldwide community;

Dissemination of the results is a key feature of ASTRODEEP:

- Guaranteed through the participation of CDS, the main european centre for astronomical data archive and dissemination;
- ASTRODEEP dedicated website, including server for data, images and catalogs, papers;
- All catalogs will be made available in VO format;
- major international conference (open to all astronomers)
- Outreach program for the general public.

4 To use these data to address some of the hottest question about early galaxy evolution;

- The first galaxies and cosmic re-ionization
  - When did the first galaxies appear?
  - What and when reionized the Universe?

- A complete history of cosmic star formation
  - Which physical processes trigger the formation of stars?
  - Which is the connection between star-formation and Quasars?

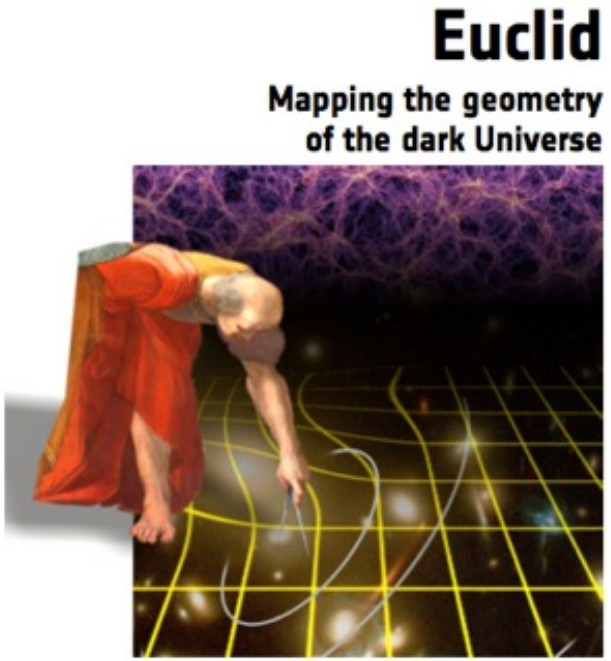
- Red & Dead and massive galaxies at high z
  - What terminates the process of star-formation rate?
  - When did the giant galaxies formed?

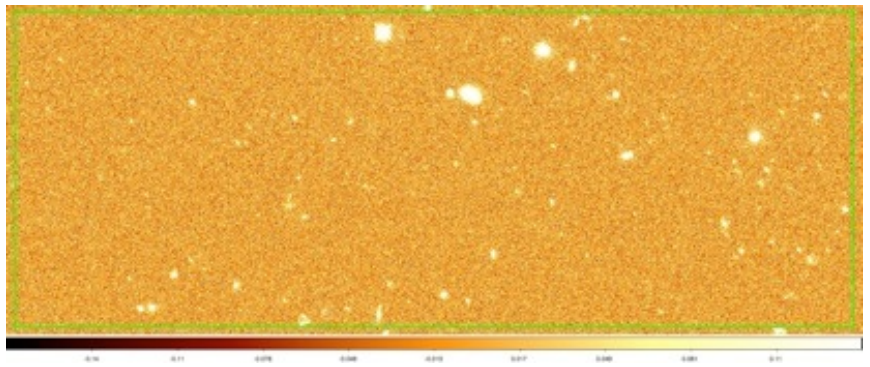
5 To establish the know-how for the future space missions, most notably EUCLID.

Euclid is the next ESA space mission.
It will survey half of the sky to investigate the nature of dark matter and dark energy.

Its deep observations are a 10000x scaled version of the ASTRODEEP data.

Our goal is to use the ASTRODEEP data to simulate the Euclid deep surveys and to test our analysis software on the huge dataset expected from Euclid





Goals are mapped onto WPs

	WP1 Management
	WP2 ScientificManagement
1. Develop and fully validate new tools for data analysis of ultradeep surveys;	WP3 Development and testing of algorithms
2. Analyze all the data from public surveys in a coherent and well characterized way;	WP4 Data Processing and catalog production
4. To use these data to address some of the hottest question about early galaxy evolution;	WP5 The physics of early galaxy evolution
5. To establish the know-how for the future space missions, most notably EUCLID.	WP6 Simulations of the Euclid deep survey
3. To deliver the final catalogs to the worldwide community;	WP7 Dissemination & outreach

Project duration

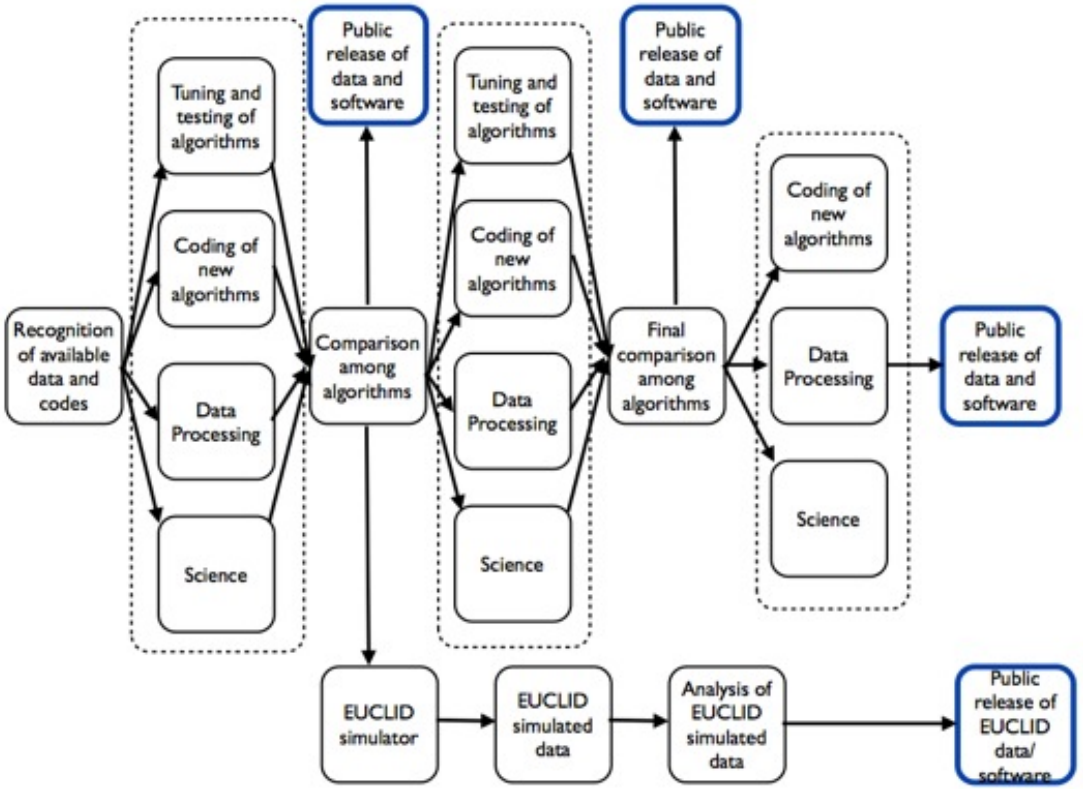
ASTRODEEP is a 3-years research program
folded onto a 4-years period.

Original proposal: 3yrs duration;
Budget is for 3 years of operations

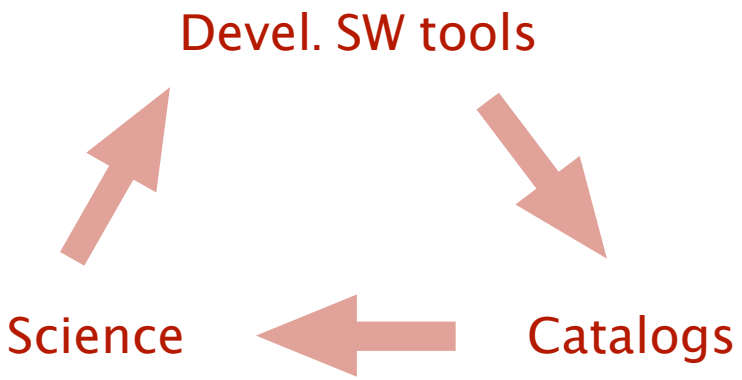
Extra time is allocated for two main reasons:

Grant proper time for hiring of new staff (first 6 months)
Grant proper time for final documentation

Development process



Not sequential, but iterative. Final validation and new requirements come from science applications



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What next?

The period until next review is crucial for ASTRODEEP

Goal#1: solve/quantify the conceptual challenges:
- final concept of algorithms, with evaluation of pros/cons;
- coding of tools for internal use
- clear path to final convergence.

Goal#2: Deliver high quality catalogs & services to world-wide astronomical community;
- Based on most recent and important surveys (CANDELS; HUDF; ULTRAVISTA; HERSCHEL-GOODS; HST-FF)
- Also with dedicated papers;

Goal#3 Trigger new scientific investigations based on these catalogs;

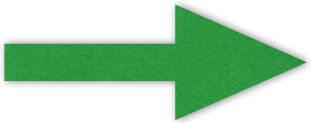
Goal#4 Deploy the plan for dissemination:
- Develop and advertise services (not only catalogs) at CDS;
- Maintain a lively website;
- Present ASTRODEEP at dedicated conferences.

Goal #5 Start looking at Euclid simulations

From Review#1 Presentation:

What next?

Goal#1: solve/quantify the conceptual challenges:
- final concept of algorithms, with evaluation of pros/cons;
- coding of tools for internal use
- clear path to final convergence.



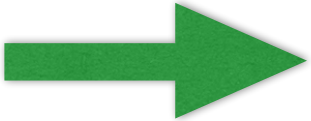
- Done
- Done
- Done

Goal#2: Deliver high quality catalogs & services to world-wide astronomical community;
- Based on most recent and important surveys (CANDELS; HUDF; ULTRAVISTA; HERSCHEL-GOODS; HST-FF)
- Also with dedicated papers;



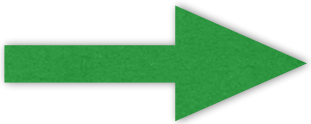
- In advanced stage: catalogs done or nearly finalized
- release not yet done: publication in progress (and FF harder than planned)

Goal#3 Trigger new scientific investigations based on these catalogs;



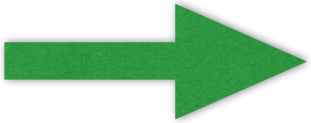
- Done

Goal#4 Deploy the plan for dissemination:
- Develop and advertise services (not only catalogs) at CDS;
- Maintain a lively website;
- Present ASTRODEEP at dedicated conferences.



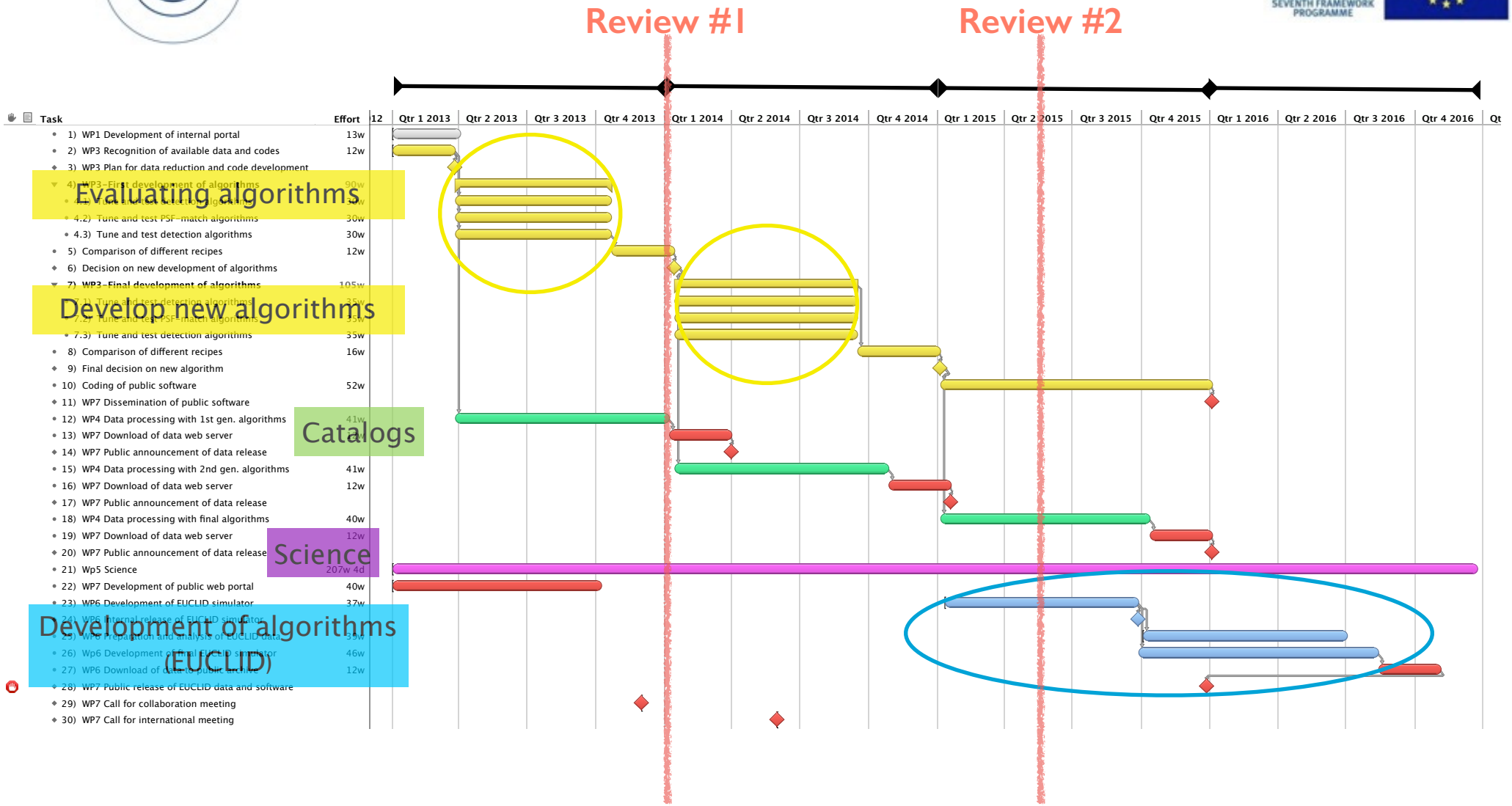
- Partly done
- Done
- Done

Goal #5 Start looking at Euclid simulations



- Done

Time schedule



Team

We don't work in isolation: our teams are large and we work in large international collaborations.

- Full participants from partner Institutions:
  - they are under ASTRODEEP budget (salary and travels);
  - they are assigned specific responsibilities related to deliverables;
  - they can be reimbursed for dissemination activities.
- Contributors from Partner Institutions:
  - they contribute to the project with their own skill and expertise, data SW etc;
  - they use the astrodeep data products and contribute to their validation;
  - they are not assigned specific responsibilities related to deliverables;
  - they can be reimbursed to attend project meetings;
  - they cannot be reimbursed for dissemination activities.
- Contributors from non-partner (U.S.):
  - they contribute to the project with their own skill and expertise, data SW etc;
  - they are not assigned specific responsibilities related to deliverables;
  - they can be reimbursed only for travels to the partner institutions following a specific mechanism (call for consultants)

Team

INAF- OA Rome & Bologna

A. Fontana
A. Comastri
R. Amorin
N. Cappelluti
E. Merlin
M. Castellano
P. Santini
A. Grazian
L. Pentericci

U. Edinburgh

J. Dunlop
N. Bourne
V. Bruce
F. Buitrago
F. Cullen
R. McLure

CDS

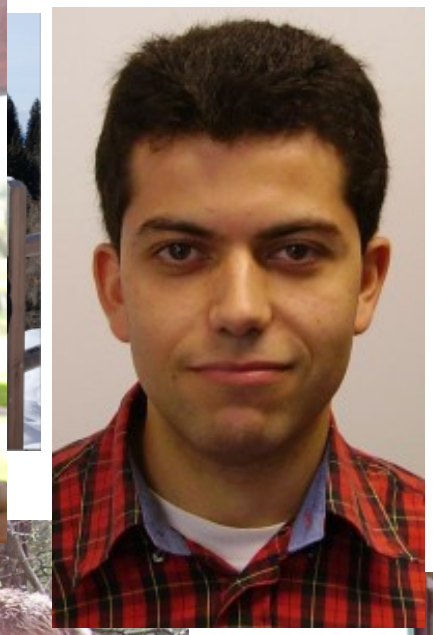
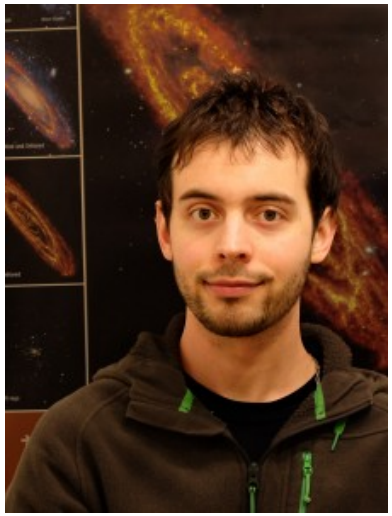
S. Derriere

CEA

D. Elbaz
X. Shu
T. Wang
C. Schreiber
M. Pannella
K. Okamura

U.S. collaborators (key participants from large international collaborations)

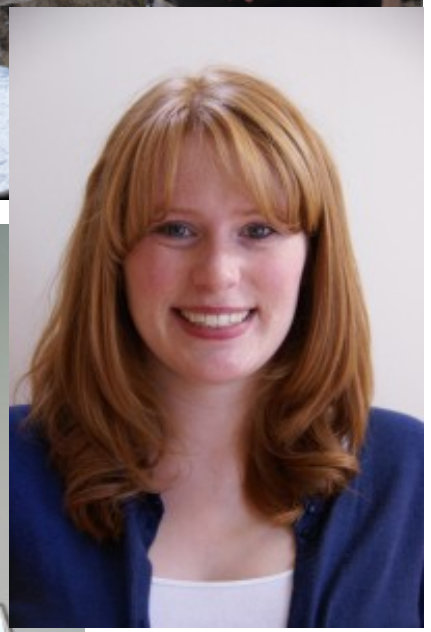
S. Faber
H. Ferguson
M. Dickinson
D. Koo
M. Giavalisco
J. Trump
etc








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