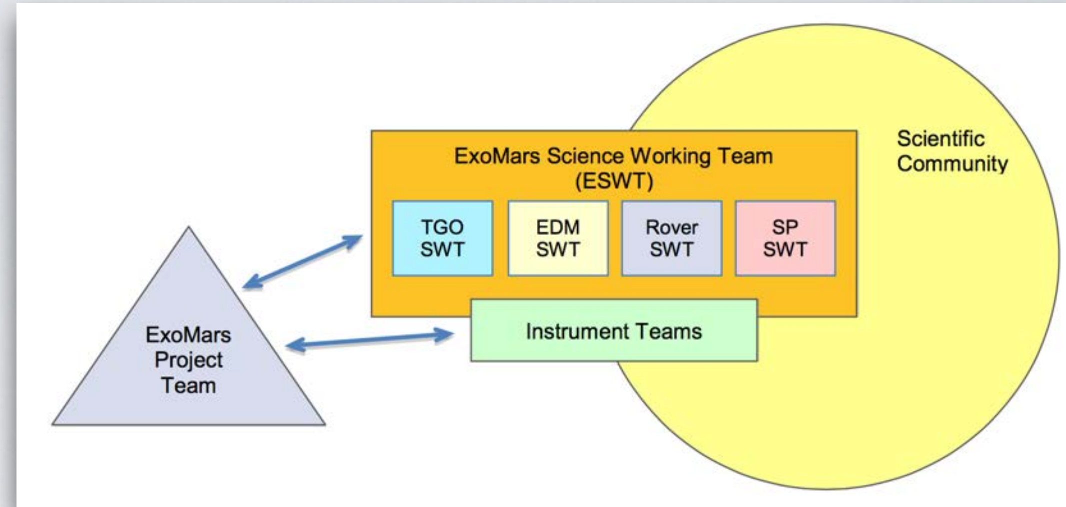
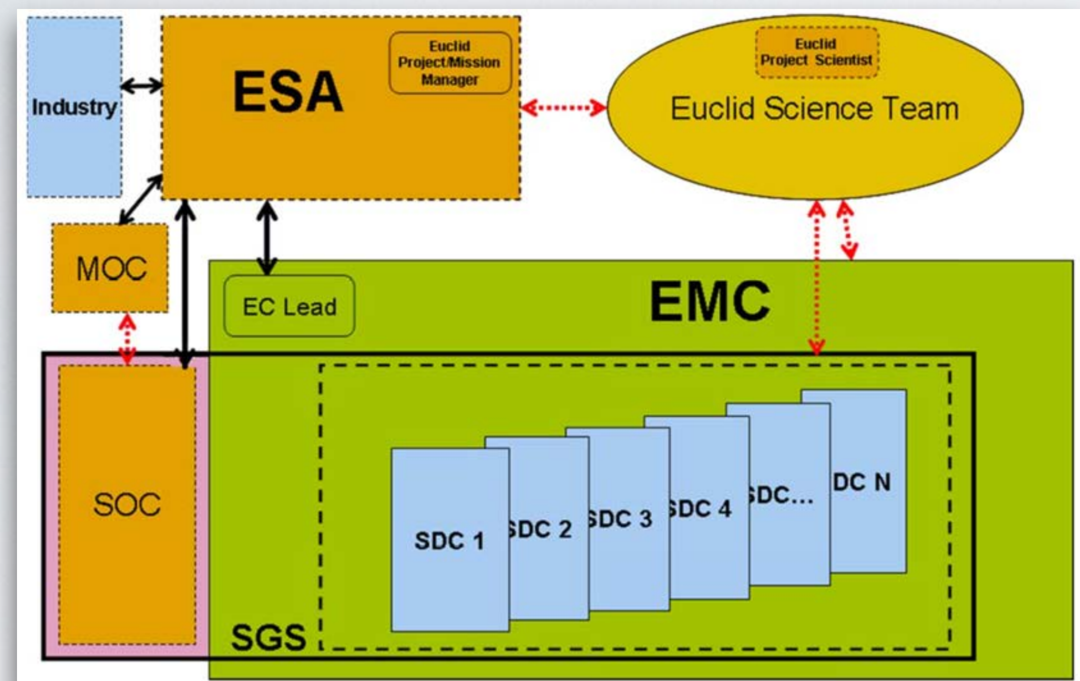
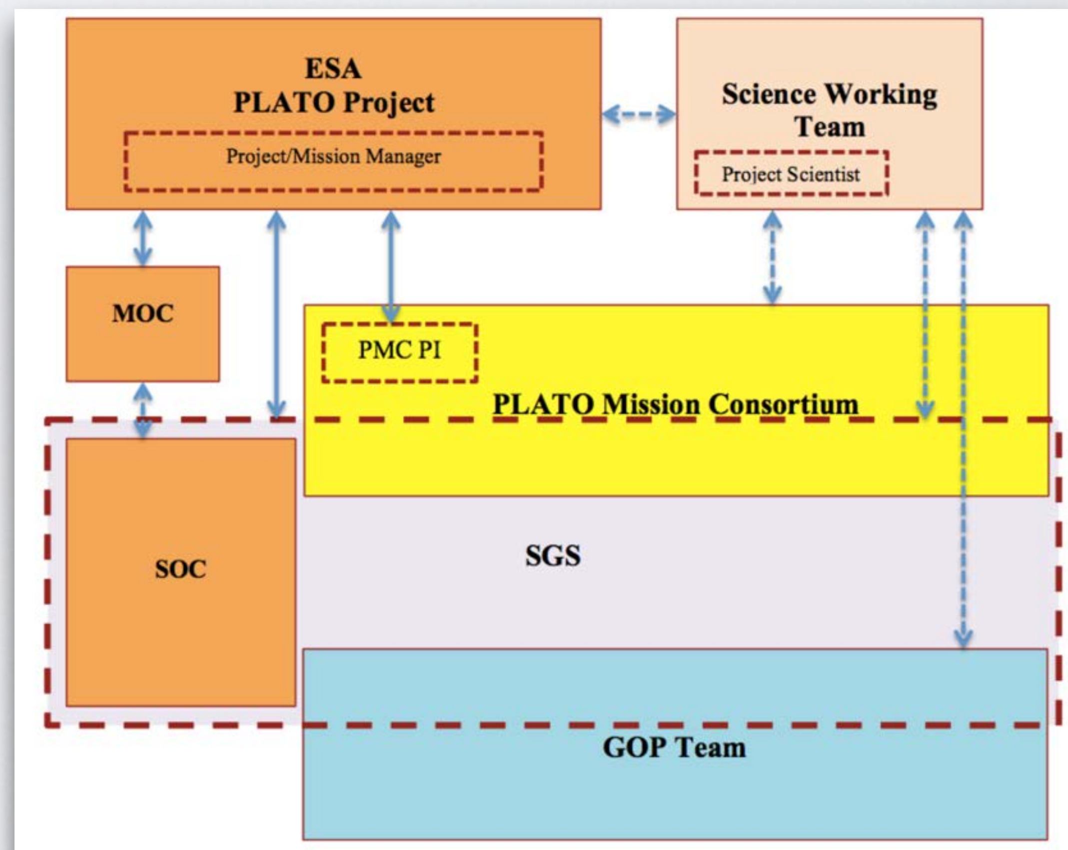






Scientific management: data rights and policy

Stakeholders in a scientific space mission

? ? ? ?

? ?

? **Which ones can you think of?**

? ?

?

Stakeholders in a scientific space mission

- Space agencies
- Spacecraft builders
- Instrument teams
- Funding bodies
- Specialised scientists using the data
- Scientists from other subfields
- Educators
- Media
- General public

What data? And who gets access, when?

How can the mission objectives be best achieved? How are the unavoidable clashes between different goals resolved? Who decides on this and how?

How are the different stakeholders represented?

What are the specific roles & responsibilities for each partner in the mission?

Which science products beyond raw data will be produced?

Who has access to these products and when?

What is the long-term perspective for legacy data?

How can the community profit from these products? Who supplies software and tools?

Interests of the space agencies

Successful and smoothly working missions, motivating funding for future satellites.

Interest general public, gain support from scientific communities and convince governments to invest in space.

Exploring new areas or new approaches in technology for satellites and instruments.

Interests of the spacecraft builders (rather industry)

Smoothly working missions, delivering success stories. motivating future projects.

Exploring new technology with possible later reuse.

Once spacecraft is in space and commissioned, only minor involvement in operations.

Interests of the instrument builders (rather academia)

Well-working instruments, delivering important results to their teams and justifying expenses by funding agencies.

Exploring new technology for instrumentation.

Sufficient time to understand and calibrate their instruments.

Compensation for large investment before launch, by having some time without competition.

Interests of the funding agencies

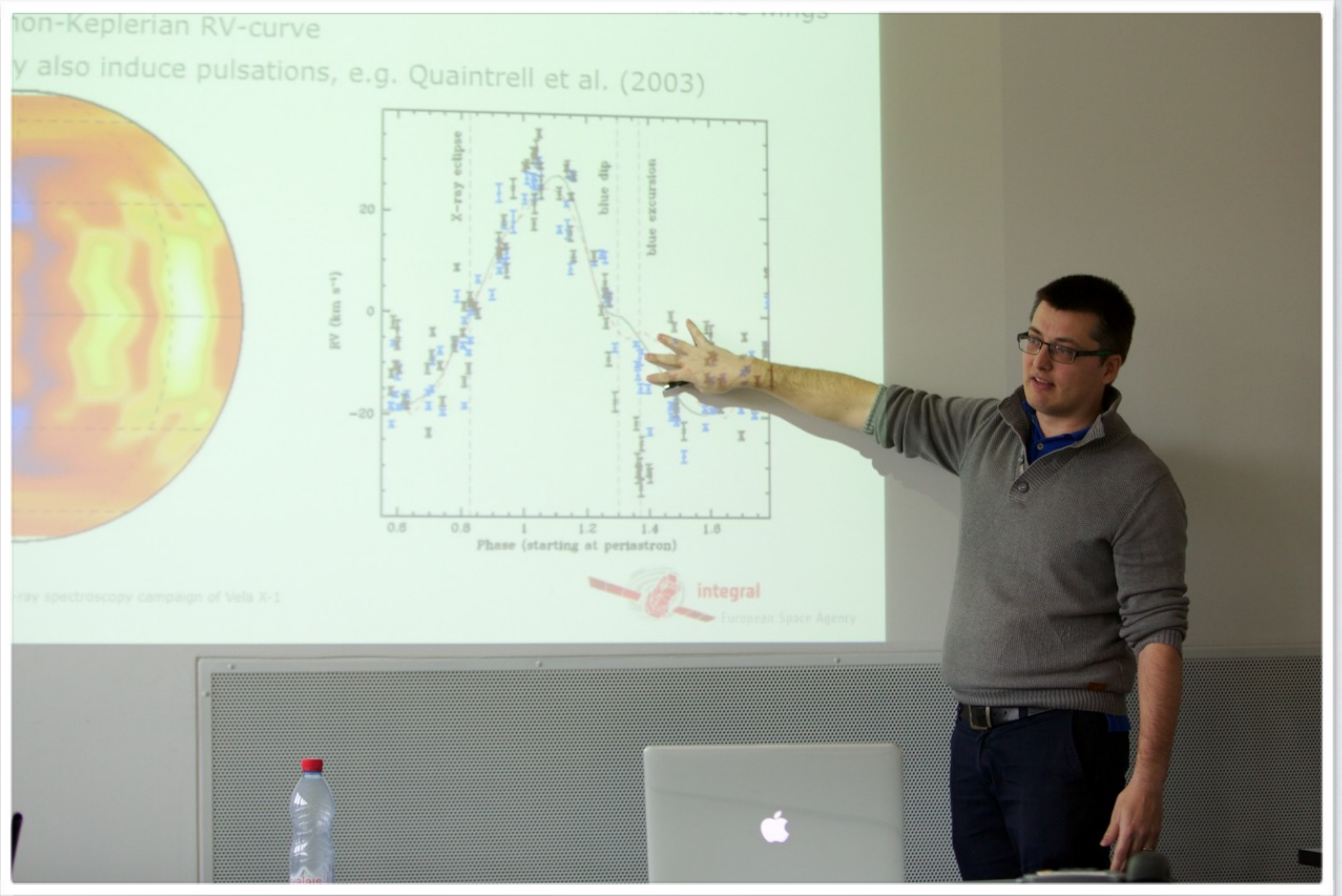
Successful missions by commonly used metrics, e.g., high publication and citation rates.

Smoothly working missions, minimising spending, maximising results.

Investments justified by results obtained from funded entities (national angle often important).

General public & decision makers convinced of programmes.

Interests of specialised scientists



Maximal access to well-corrected and calibrated data.

Interesting results and corresponding publications for themselves and their institutes.

Well working analysis tools, correct and detailed documentation.

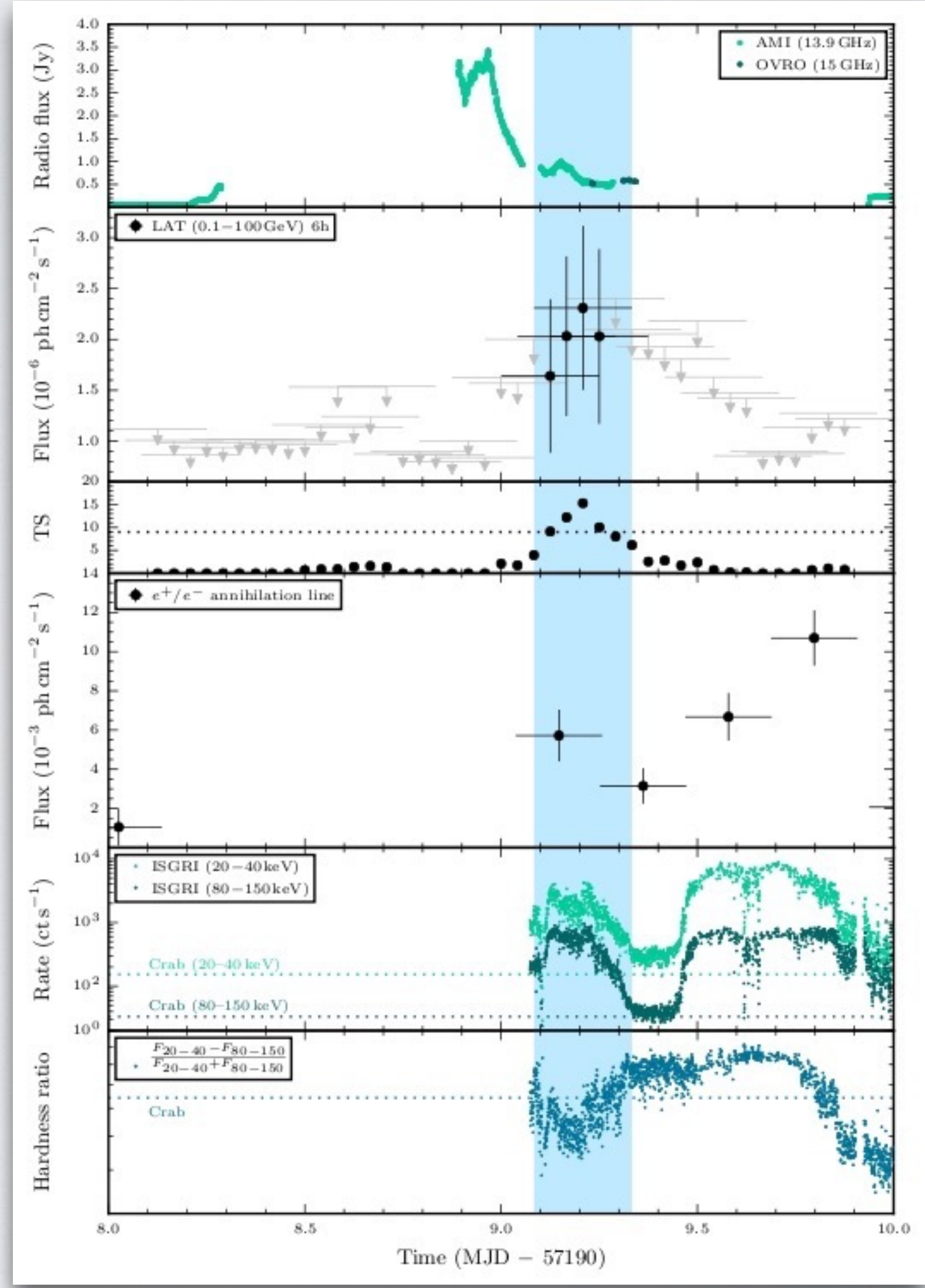
Interests of non-specialist scientists

Maximal access to reliable data products that are ideally directly useful for publication.

Data that can be put into context with other measurements.
(INCLUDE V404 Cyg curve here!

Interesting results and corresponding publications for themselves and their institutes.

Easy to use analysis tools, with comprehensible documentation.



Interests of educators

Easy to find high-level results, interestingly presented.

Simple data access from anywhere.

Easy to use analysis tools, with comprehensible documentation for more advanced student projects.

Possibly: data availability on new platforms.

Interests of media

Exciting results, presented in a way suitable for lay people.

Catchy stories, snappy presentation, human angle.

Relation to their public (country, specialised interests, economy, …)

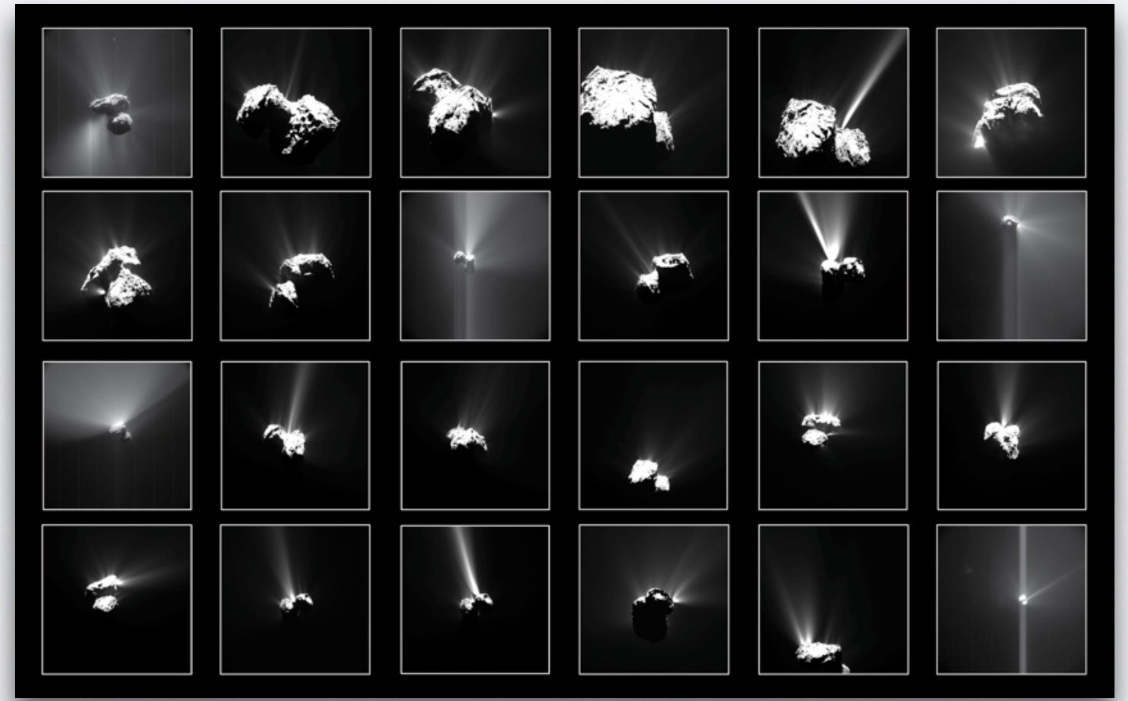
Easy to find high-level results, interestingly presented in visually attractive form.

Interests of general public

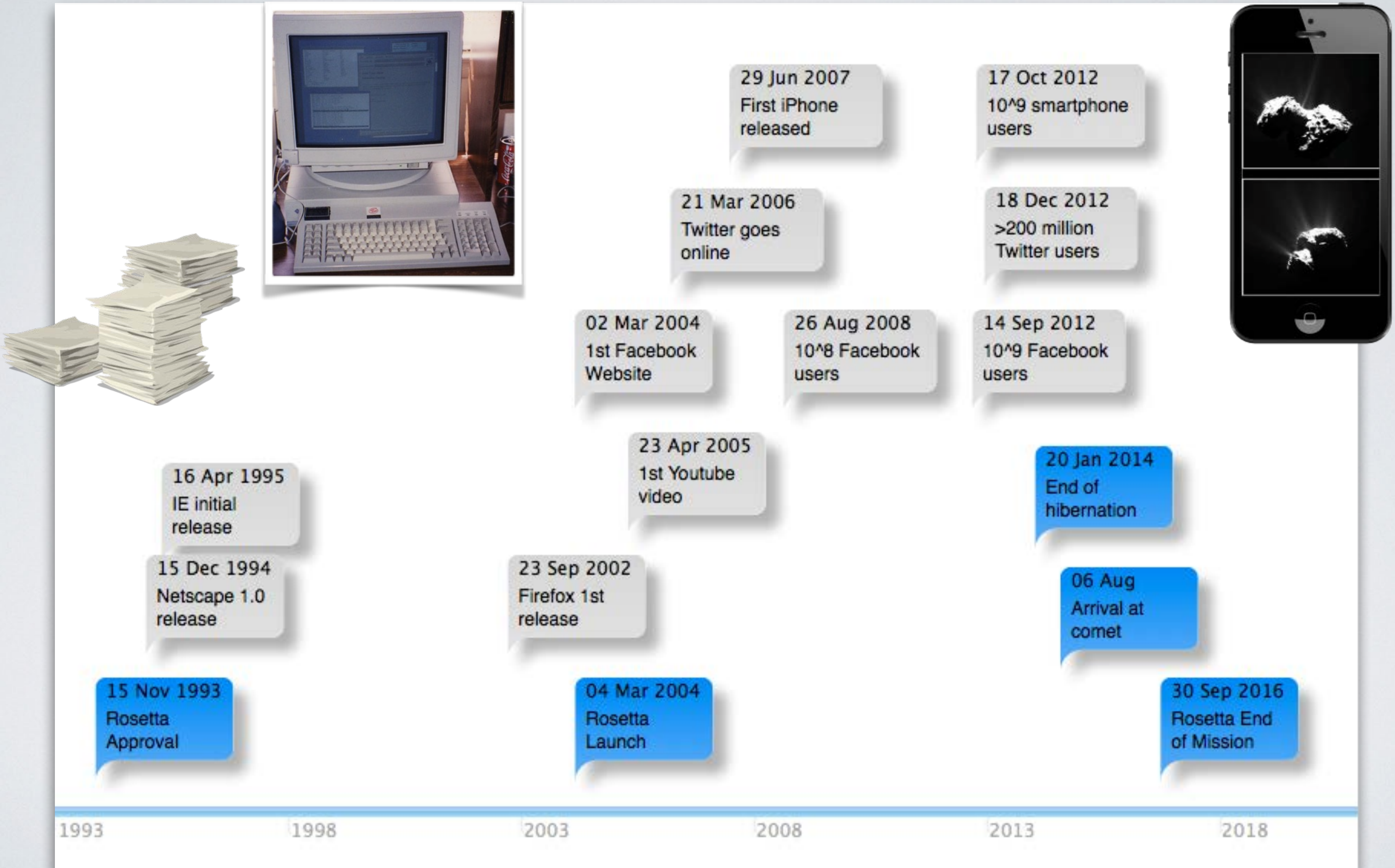
Easy to find high-level results, interestingly presented in visually attractive form.

Explanation of results and their relevance for lay people.

Access anytime from anywhere by any means.



The times they are a-changin' …




Media
Scientists
Agencies
Educators
Teams
Public

Science Management Plan

Within ESA framework, fundamental document agreed on early in development phase and approved by ESA's Science Programme Committee.

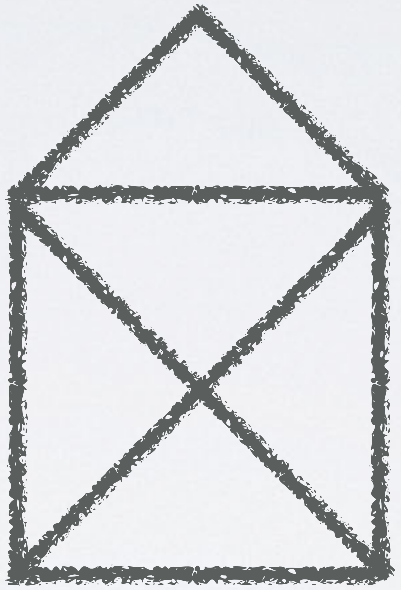
Legally binding document defining all the ground rules of scientific collaboration:

- Who is involved (all partners of science exploitation)?
- What kinds of data will be produced? And who is responsible for which parts?
- How will data be made available to the various stakeholders? Who has which rights exactly?
- Who decides on observing plans and on which schedule?

It is critical to have such a document carefully thought out and well understood by all involved parties.

Agree on what you agree on

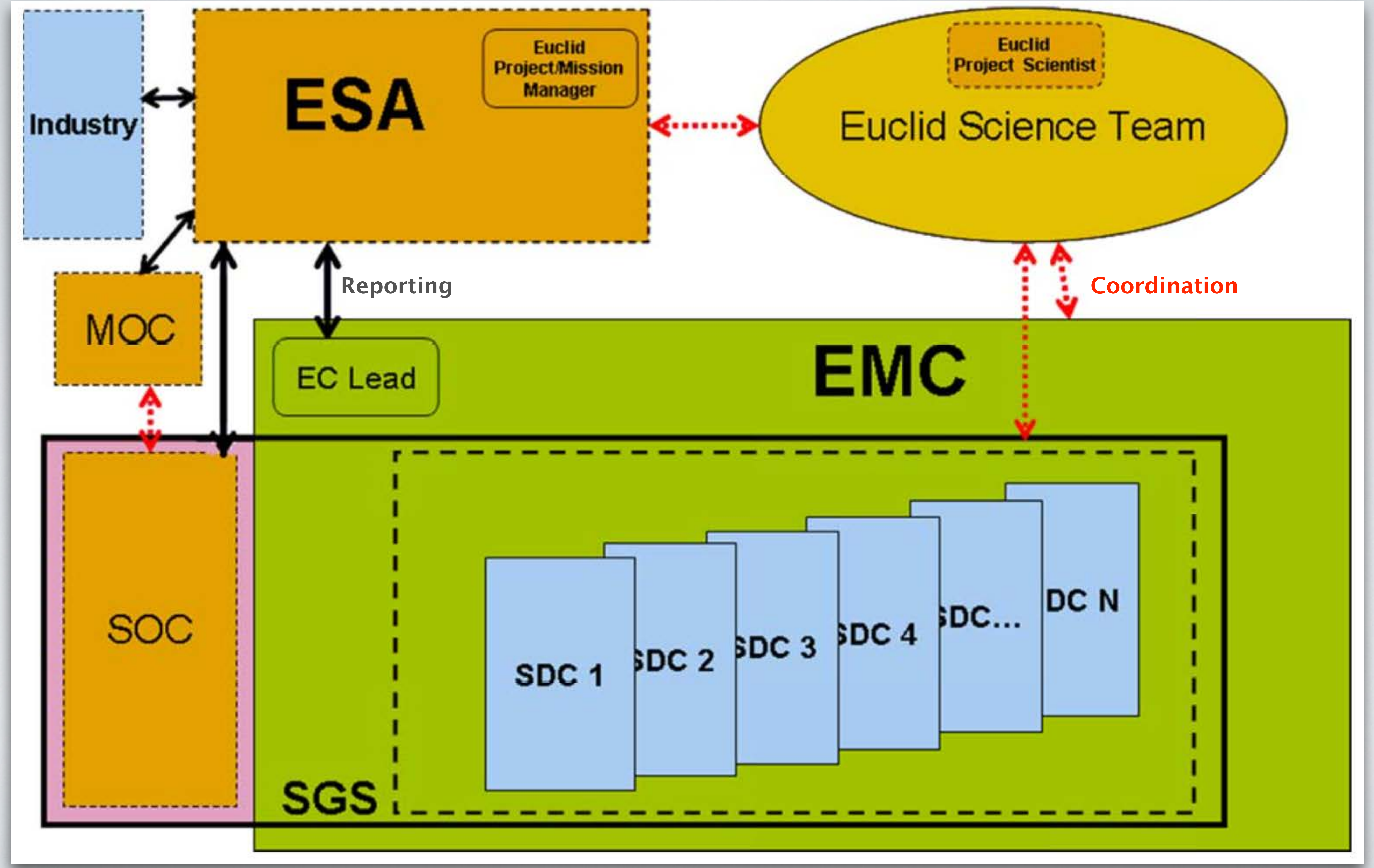




Science Management Plan – Example Contents

1. Introduction, Purpose & Scope
2. Mission Overview:
   objectives, phases, milestones, operations, consortia, selection process
3. Science Management:
   decision structure, roles & interactions
4. Ground Segment:
   elements, roles & responsibilities of all partners
5. Science Products:
   products, delivery scheme, data rights, publication policy,
   public relations, education and outreach plan

Example: Euclid Science Management Overview



Protecting the Legacy – Data Management

A space mission's legacy is its archive of **usable data**, plus **tools** and **documentation**.

The Science Management Plan must ensure that the legacy will be safeguarded, but also detail how the valuable data will be made available while the mission is active.

The monetary value of data
Cost of space mission: $F \times 10^8$ €
Seconds in a year: $\pi \times 10^7$ €
➥ Value of a second of data:
$(10F)/(N\pi\varepsilon)$
where
N = mission duration in years
ε = fraction of time data taking (<1!)

Data management schemes

Which ones would you consider?

Playing it safe – fully protected data

+ Maximum protection of interests of satellite/instrument builders.
+ Full quality control; time for careful analysis of difficult topics.
+ Trivial to define.
- Lowered community interest.
- Risk of some data never being published at all.
- Community cannot address new questions, beyond those considered by core team.

There is no free lunch – but maybe free data

+ Higher interest in community, more potential users.

+ Tendency for fast publication of exiting results.

+ Trivial to define.

+ NASA’s baseline for new missions.

− Possible lack of motivation for data providers.

− Only fully useful if analysis can be done by non-experts. Is the software also free?

− Risk of spurious results or even abuse for critical data.

Common middle ground – partially protected data

+ Allows to keep some motivation for all parties.
+ Fine tuned access for different needs.
+ Time limits can be set to assure all data becomes public at some stage.
+ Common approach for many missions.

– The devil is in the detail! Can be complex to implement and risks friction over exact solution.

– Possible risk to make no-one fully happy.

Common schemes for partial data protection (1)

Astronomical Observatory:

- Yearly round of applications for observing time.
- Successful proposers have their observations protected for one year after data has been made available to them. Afterwards, all data is made immediately public.
- Selected observations are made public immediately, e.g., Target of Opportunity approved without pre-existing application.

Astronomical Survey:

- Data is kept private within Consortium during time required for achieving basic survey goals.
- At release of survey results, data used for this survey is made public (latest example: Gaia).
- Usually staggered approach with multiple, more and more refined releases.

Common schemes for partial data protection (2)

Solar System mission:

- Original data is private. Processed data delivered to archives after peer review, with time limits. Details depend strongly on specific partners.
- Push towards more complete public archives.

Earth Observation (old style):

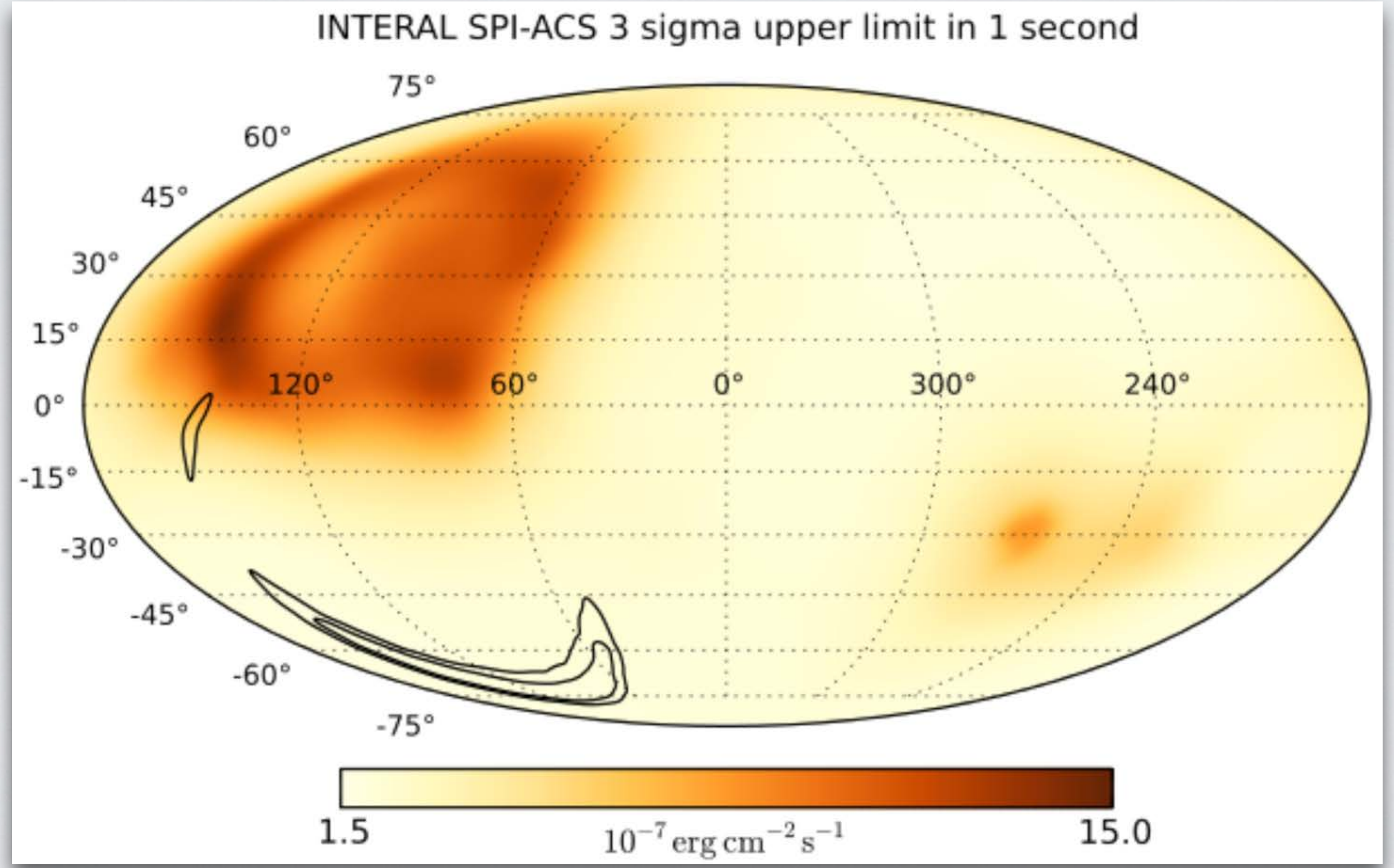
- Data private to satellite operators, results made available (often commercial).

Earth Observation (new style):

- Most data made available free of charge after registration, but ESA keeps redistribution rights.
- Some data (esp. radar) restrained, as created on specific requests. Also security and privacy concerns. Access possible through proposals.

Data can be used in ways not originally imagined

INTEGRAL Spectrometer Anti-coincidence shield, currently most sensitive all-sky detector for bursts of hard X-ray / soft gamma-ray data ➟ suddenly important for Gravitational Wave counterparts. Data (rate measurements) is house-keeping and freely available - but difficult to analyse.

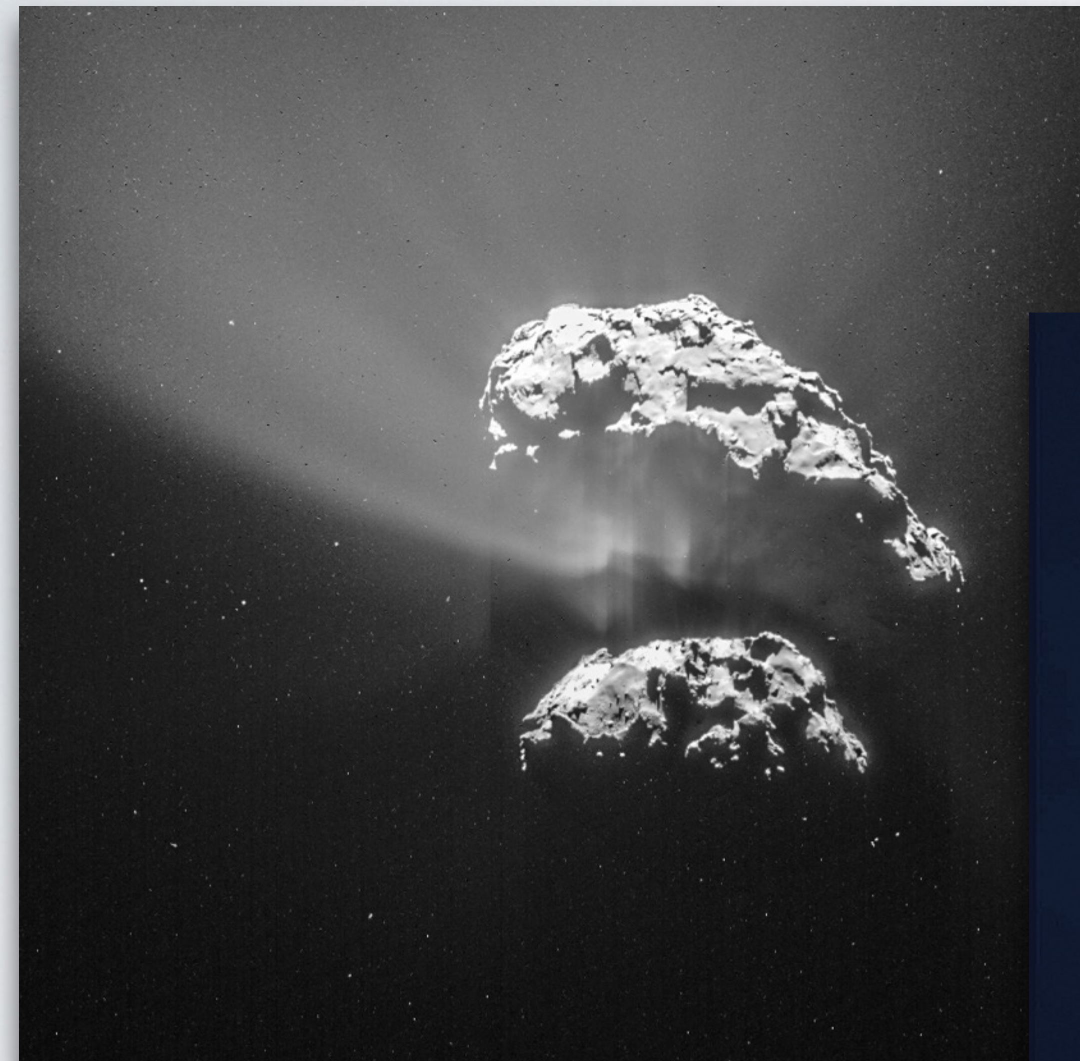


Savchenko et al. 2016

Data from one instrument might be seen as infringing on rights of other

On Rosetta mission, the OSIRIS camera team was concerned about ESA releasing images from the missions navigation camera (NAVCAM).

OSIRIS image © OSIRIS team



NAVCAM image © ESA

Summary

Identify all your stakeholders, understand their needs

Devise a scheme for data taking and distribution matching your mission's profile and stakeholder interests and considering the legacy.

Remember that the environment may change and new needs may arise.

Have clear and unambiguous agreements, signed by everyone in full understanding of their implications.