11:15 am

NEOMI: are you ready to Boost Future Earth Observation Space Missions?

Chair(s)

Dr. Craig James Donlon (ESA - ESTEC)

Room:
Agora EUROPA/ESA

Topic:
Open Forum

Form of presentation:
Agora Oral

Duration:
90 Minutes

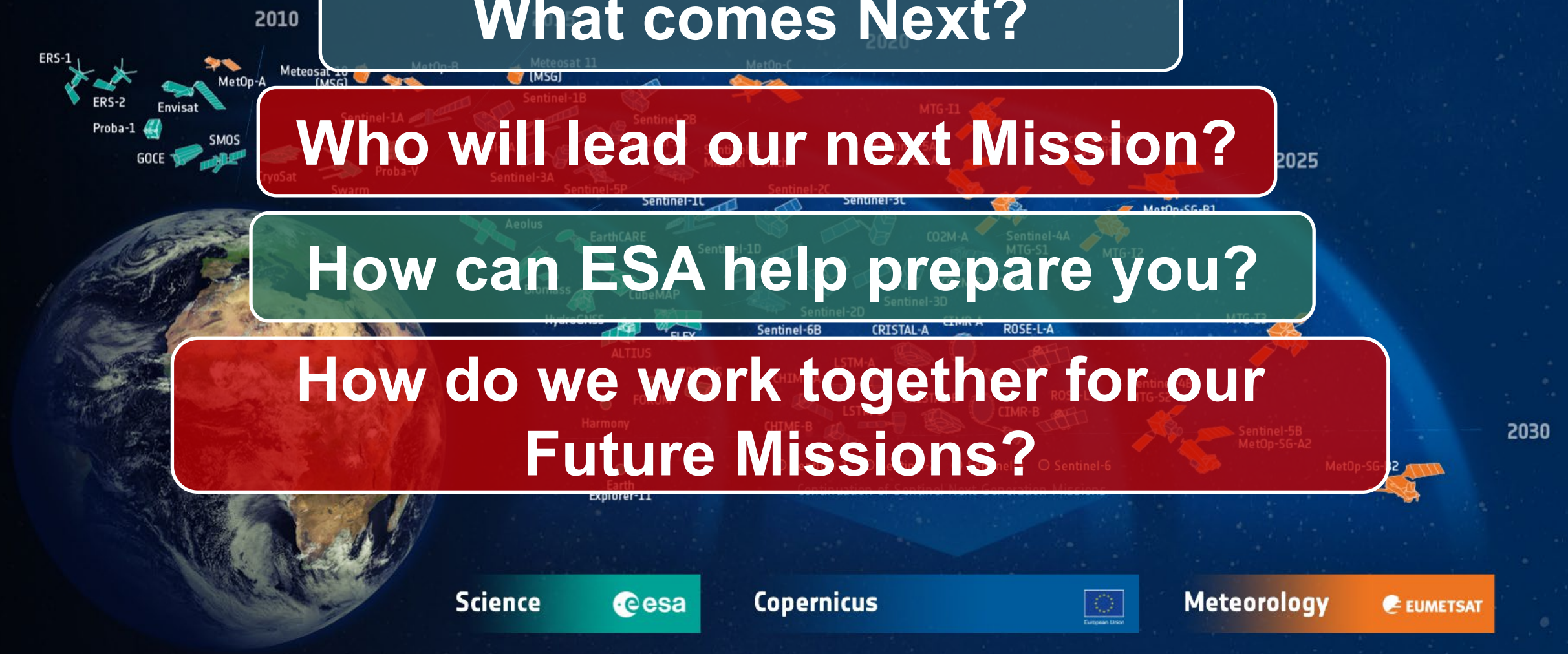
Description :
New Earth Observation Mission Ideas - NEOMI - is a new approach at ESA that takes a fresh look at new ideas for an innovative satellite mission by empowering new science teams to bring their ideas to maturity. Translating an idea to a preliminary scientific mission concept is a challenge that is all about scientific rigour and maturity: getting your ideas into shape for potential further development at ESA is what it's all about. How do you do that? How does ESA help you? How do you get started ? This Agora will be a fast paced open discussion together with the ESA NEOMI team covering all things new: What's your new scientific idea? How can you become a new science leader? How can you develop new measurement concepts? What are our new ways to work in NEOMI? Join us at this Agora to discover how to get on-board with ESA NEOMI.

Speakers:
V. Keuck (ESA/EOP-C, ESTEC, The Netherlands),
B. Carnicero (ESA/EOP-F, ESTEC, The Netherlands),
L. Giulicchi (ESA/EOP-P),
F. Ardhuin (IFREMER, France)

What we want from this Session (not presented)

- We are here in this AGORA to listen to your view and ideas about NEOMI
- Will NEOMI address what you need?
- How can you help us improve our Science activities in the very early mission phase?
- Clarify what we are expecting from your NEOMI activities
- **Structure:**
    1. Welcome
    2. Introduction of Panel
    3. You the challenges (requirements)
    4. Interactive Panel Discussion + Q&A have a great Scientific Idea! Now what do you do? (F. Ardhuin) what are
    5. Boost Future EO Short Summary providing context to NEOMI and advertising of Session, (Vanessa)
    6. PPT overview of NEOMI (what are the problems we are trying to solve)
    7. Importance of NEOMI in a later phases (system) of the mission MDD (Luisella)
    8. Interactive Panel Discussion + Q&A → The implications of Good, Bad and Ugly Requirements and Traceability (Panel Discussion)
    9. Interactive Panel Discussion + Q&A
    10. Scientific Readiness Levels – why do they matter (Summary and Panel discussion)?
    11. Interactive Panel Discussion + Q&A
    12. Panel Summary – What we learned recap
    13. Interactive Panel Discussion + Q&A

ESA-DEVELOPED EARTH OBSERVATION MISSIONS



What comes Next?

Who will lead our next Mission?

How can ESA help prepare you?

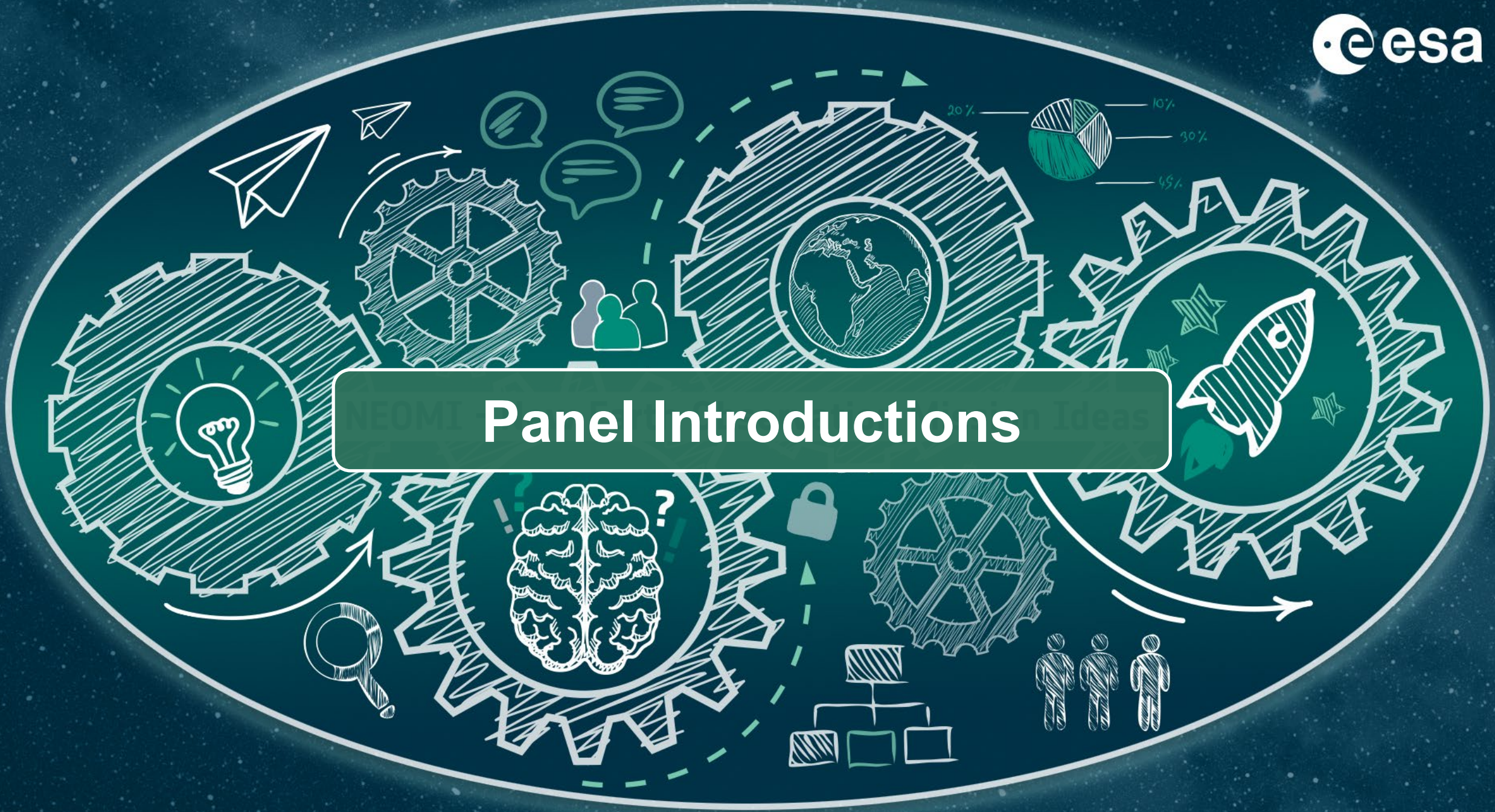
How do we work together for our Future Missions?

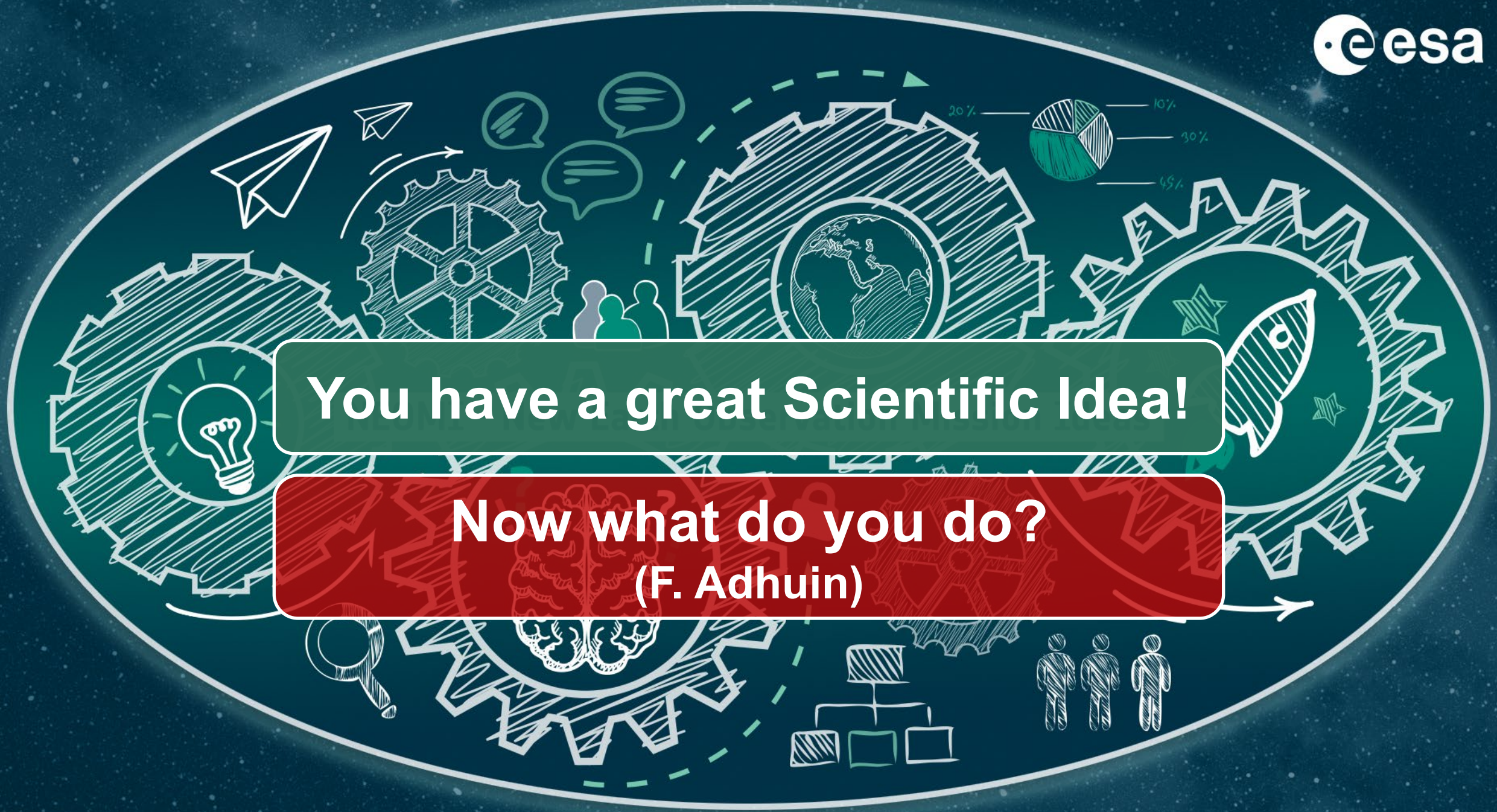
Science esa | Copernicus European Union | Meteorology EUMETSAT

Outline of of our time together today

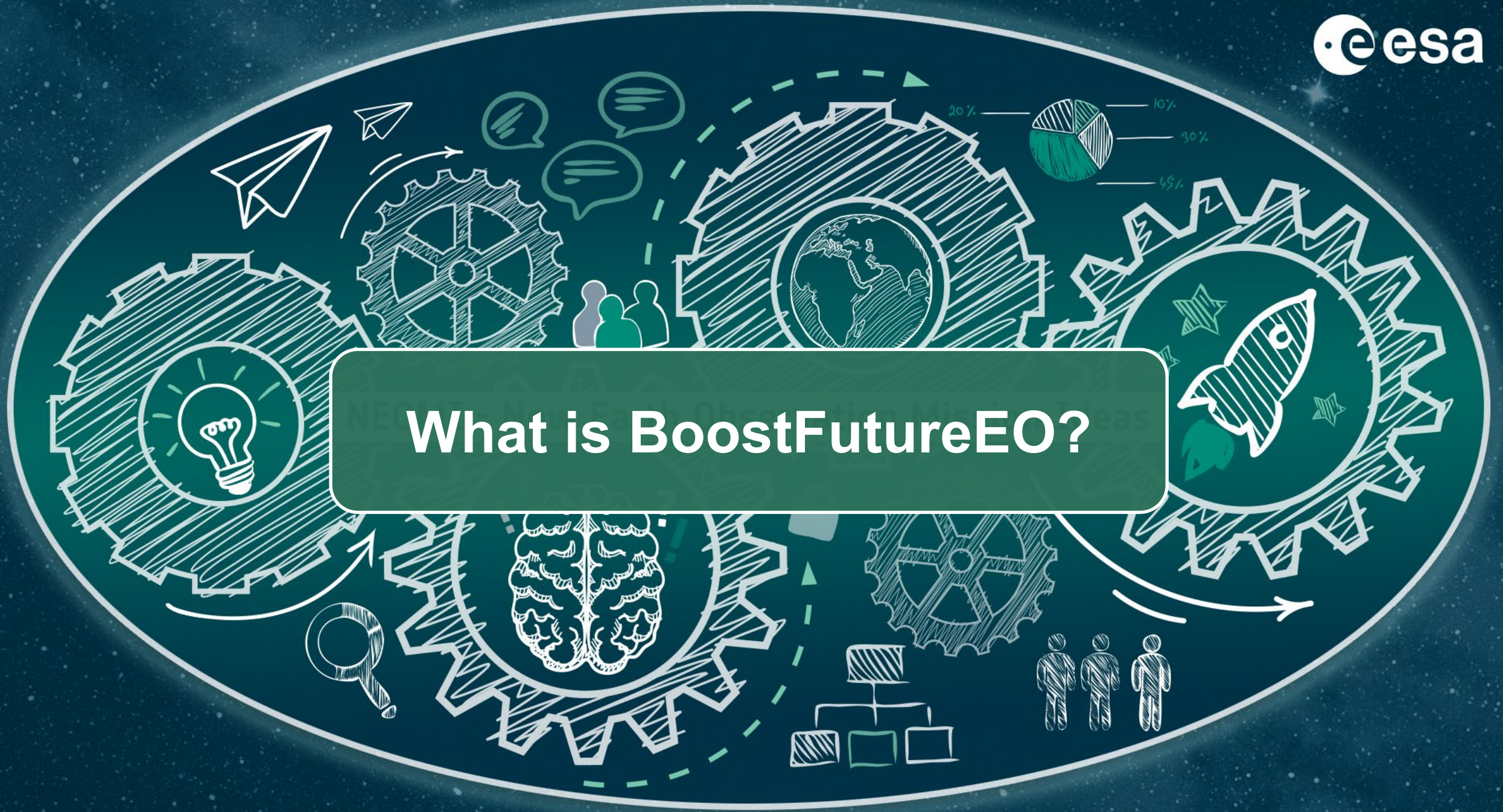
- Welcome and Panel Introduction
- Some Real World experience
- What is Boost Future EO?
- What is NEOMI and how does it work?
- Why is NEOMI important?
- Scientific Readiness Levels – why do they matter
- Discussion throughout the session – Say what you think!

Panel Introductions




You have a great Scientific Idea!
Now what do you do?
(F. Adhuin)

Fabrice Slides if needed


What is BoostFutureEO?

BoostFutureEO (early phases) at LPS 2022

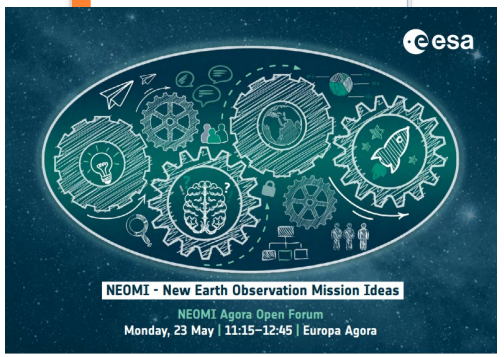
Monday

Agora EUROPA/ESA

NEOMI: are you ready to Boost Future Earth Observation Space Missions?

11:15 am - 12:45 pm
Topic : Open Forum
Form : Agora Oral
Chair(s): Dr. Craig James Donlon (ESA - ESTEC)

Step 2



Wednesday

Agora SAPIENS

BoostFutureEO early phases: A smart evolution for the Earth Explorer – ESA´s world-class science missions for Earth

10:40 am - 11:40 am
Topic : Deep Dive
Form : Agora Oral
Chair(s): Dr. Vanessa Keuck (ESA - ESTEC), Florence HELIERE (ESA - ESTEC)

All steps

Friday

Agora EUROPA/ESA

Earth Observation Science Strategy

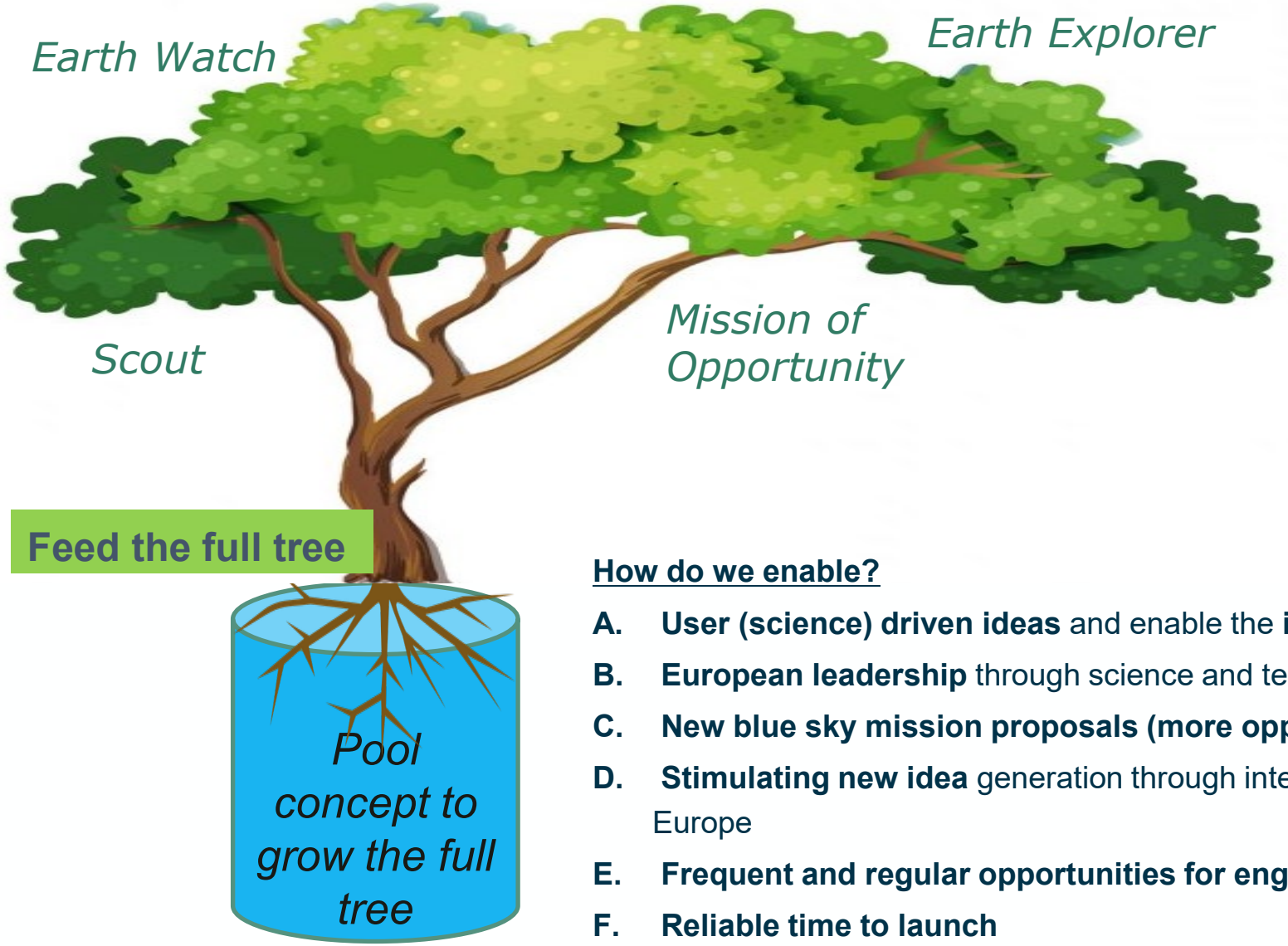
08:30 am - 10:30 am
Topic : Deep Dive
Form : Agora Oral
Chair(s): Dr. Florence Rabier (ECMWF), Prof. Johnny A. Johannessen (Nansen Environmental and Remote Sensing Center)

Step 1

Step 1
EO Science Strategy Foundation Study Open ITT:
https://esastar-publication.sso.esa.int/ESATenderActions/details/42846

(*1-11373 - EO SCIENCE STRATEGY FOUNDATION STUDY - EXPRO+ Issued - closing date: 15/07/2022 13:00:00.)

How can we enable ambitious and challenging Earth Explorer missions for the future?



Our ambition:

"ESA maintains high levels of scientific excellence and technological innovation by pursuing different classes of missions that must include **large, ambitious and challenging Earth Explorer missions** to secure its position of international leadership in Earth Observation."

(Independent Science Review, 2021)

How do we enable?

A. **User (science) driven ideas** and enable the **implementation of world class Earth science**
B. **European leadership** through science and technological innovation
C. **New blue sky mission proposals (more opportunities)**
D. **Stimulating new idea** generation through international cooperation of scientists and industry across Europe
E. **Frequent and regular opportunities for engagement**
F. **Reliable time to launch**

BoostFutureEO - A global scenario to grow future missions…

Step 1: New approach to a revision of LPC including observational gap analysis

Step 2: New EO Mission Ideas (NEOMI)

Step 3: Call for ideas followed by Phases 0 and maturation activities for ‘commended’ missions

Step 4: Selection of missions for Phase A and implementation of Phase A

Step 5: Selection of mission for implementation followed by Phase B/C/D/E1

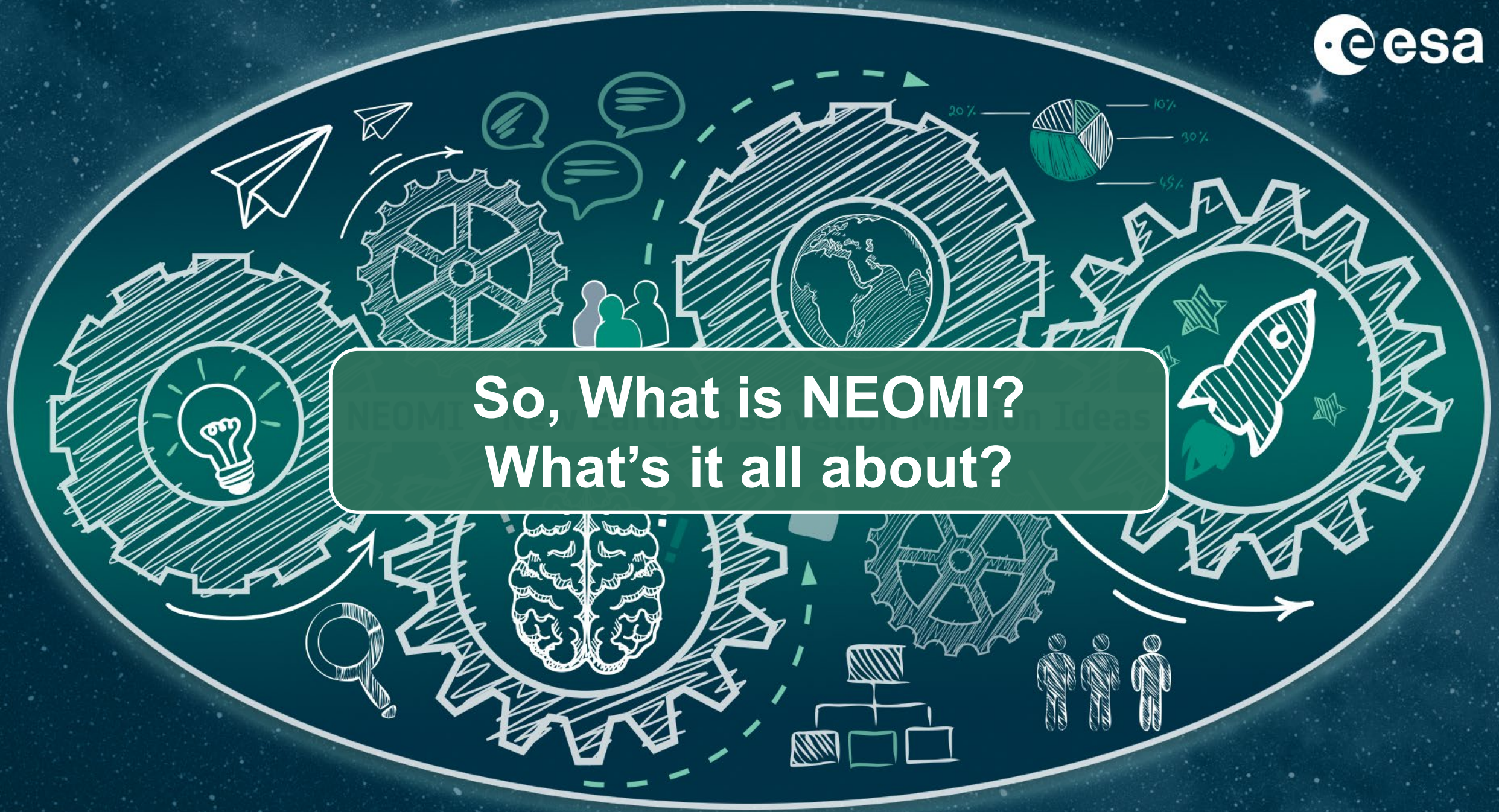
Call of ideas

Step-3
Phase 0 and Maturation

Step-4
Phase A

Step-5
Mission Implementation

Step 1: New approach to a revision of LPC including observational gap analysis


So, What is NEOMI?
What's it all about?

NEOMI: What is it all about?

- New space missions are complex to initiate and move forwards!
- NEOMI is about nurturing a better engagement with a new and diverse generation of Lead Investigators

- It's about getting your early blue-sky innovation idea to the table
- It's about leveraging the European Space Agency to move it forwards
- It's about bringing Scientists together with ESA and our way of working together – Getting On-Board with ESA!

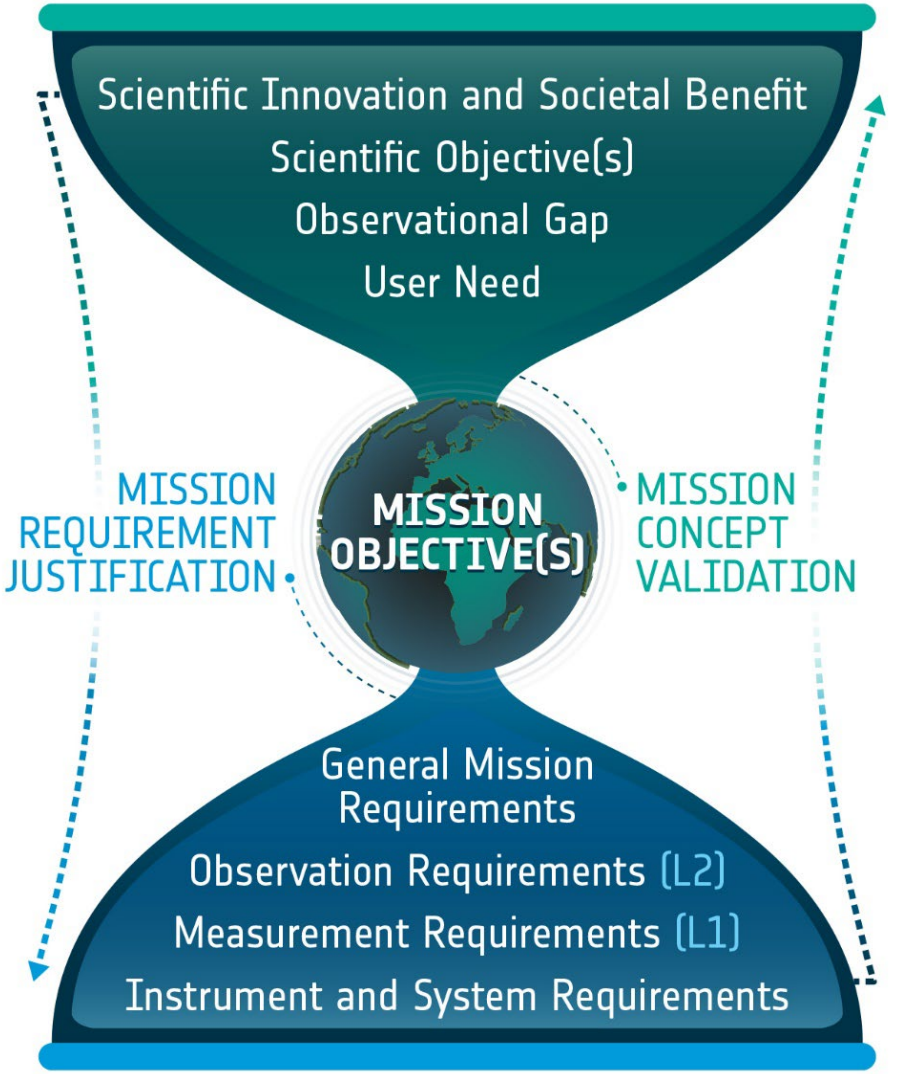
- It's about removing early career barriers to working with ESA
- It's about recognising and empowering diversity of Scientists and their New Earth Observation Mission Ideas

What are we looking for?

- We want new and diverse ideas for future missions covering any aspect of Earth Observation:
  - New measurement techniques
  - Developing laboratory measurements for space
  - Or based on a Theoretical starting point

- We want new and diverse teams and new Lead investigators from Scientific Institutions

- We want to help you get your ideas into shape and into space. This means getting your ideas better organised and better formalised
- We want to develop ideas to SRL=3 using an hour glass approach – you can enter at any point



NEOMI and Scientific Readiness Levels (SRL)

SRL	Name (ESA)	Associated documents (ESA)	Theory	Experiments	Users & Requirement	Targeted Project Phase (ESA)
1	**Scientific Idea Formulated**	Scientific Report	- A scientific challenge is identified. - The scientific objective is formulated. - A scientific hypothesis is established.	No observational evidence is required.	- The application area is defined. - Interest of the users is identified. - High-level scientific requirements are identified.	-
2	**Scientific Idea Consolidated**	Scientific Report	- A scientific theory is formulated. - The physical principle behind the hypothesis is outlined (at least qualitatively).	- Experimental / Observational evidence supporting the scientific hypothesis exists.	- Scientific objective is formulated. - Consolidated scientific requirements are established.	-
3	**Scientific, Observation & Measurement Requirements Drafted**	Scientific, Observation & Measurement Requirements Document	- Theoretical understanding of link between measurement and observation (no software required) is established and described.	- Initial capability assessment performed. - Conceptual measurement technique is identified.	- Mission Objective(s) are drafted.	Before Phase 0
4	**Mission Concept Feasibility Shown**	Draft MRD / Report for Mission Assessment	- Measurements are simulated based on geophysical parameters (e.g. numerical forward model).	- First measurement device approximating the instrument is available. - Sensitivity of measurements wrt observation is demonstrated.	- Mission objective(s) confirmed and translated into mission requirements and system requirements	Phase 0

NEOMI-Pilot

New (People + New ideas)

NEOMI Open ITT

Evaluation and Selection

NEOMI-2 Contract Award

NEOMI-1 250K (12 month duration)

NEOMI-2 250K (12 month duration)

NEOMI-3 250K (12 month duration)

5 day NEOMI Science On-boarding
Training on-site @ESTEC

3 new EO Mission Ideas

3 new Lead Investigators

Potential input to Future ESA Calls for new Missions

SRL=4+ →

← NEOMI cycle (12 month Study) →

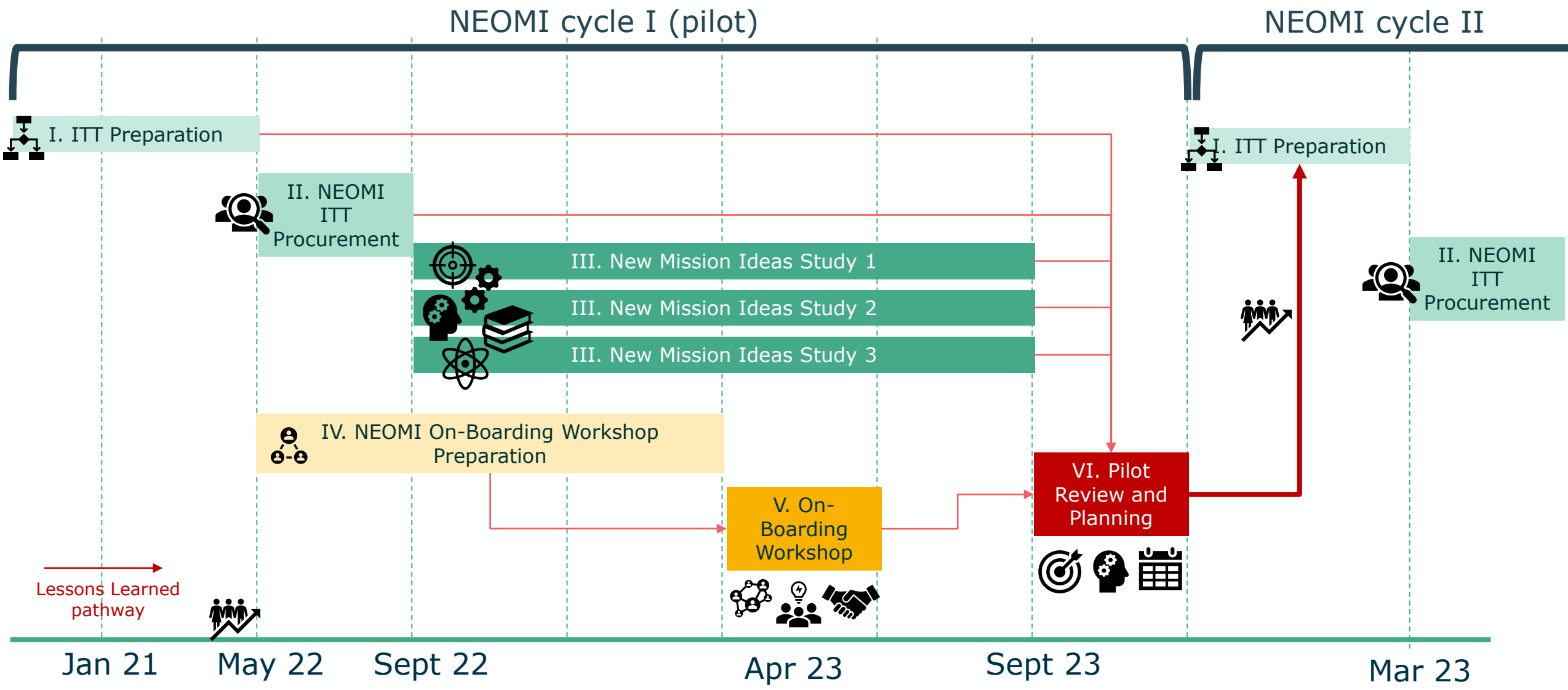
SRL=0 → SRL=1 → SRL=2 → SRL ≥ 3

NEOMI On-Boarding Week @ESTEC

- Effective 'training' in the processes you need to use to prepare and submit a future proposal to ESA
- Focus on Requirements setting – and their impacts – what can possibly go wrong with your requirements…
- Hands on learning approach
- Opportunities of New Lead Investigator Network building
- Access to support services we will explain how ESA works practically to support you
- 5 members of each NEOMI team will come to ESTEC for 5 days

Timing	Day-1	Day-2	Day-3	Day-4	Day-5
AM-1	Welcome, Introductions and overview for the workshop. Meet ESA people and exchanged expectations	*Lecture-2: Defining User need, mission Aim and Objectives*	*Lecture-5:* Satellite Implementation: Challenges and Successes	Hands-on Requirement Management Exercise (HoRME²) ,	HoRME Lessons Learned
AM-2	*Lecture-1:* The lifecycle of a satellite from concept to de-orbit	*Lecture-3:* Scientific Mission requirements and management, Traceability and their evolution	*Lecture-6:* Scientific simulation tools and evidence-based approaches	HoRME II	NEOMI General Discussion
Lunch					
PM-1	Presentation and discussion of NEOMI studies (x3)	*Lecture 4:* Changing Mission Requirements: Why, How and what are the impacts	*Lecture-7:* Scientific Support Campaigns	HoRME III	NEOMI on-boarding Wrap-up, feedback and close
PM-2	Team Building Visit to ESTEC facilities (e.g. Test Centre, CDF facility)	*Workshop-1:* Evolving your NEOMI Scientific Mission Requirements	*Workshop-2:* Traceability and your NEOMI Scientific Mission Requirements	HoRME IV	
Evening	Icebreaker (Escape?)	Dinner		Dinner	

NEOMI Pilot: Implementation timeline



Key Output: Mission Description Document (MDD)

Scientific innovation, societal benefit and user needs of your NEOMI

- Why is your NEOMI needed (main problem to address)?
- What is the current state of the art?
- Numbered User Requirements (used for traceability)
- How is your NEOMI innovative?
- Who needs observations from your NEOMI and why?
- What are the scientific aim and objectives of your NEOMI?

Scientific Objective and Observations

- Numbered general mission requirements (applicable to all data product levels)
- Observations provided by your NEOMI
- What observations are available today and what is new?
- Scientific first principles related to the processes linking scientific objective and L2 observations
- Definitions and assumptions related to the mathematical description of the processes
- Numbered observation requirements (applicable at L2), their justification and traceability to the objectives
- NEOMI L2 product description

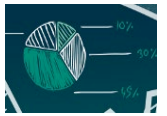
Observables and Measurements

- Scientific First principles relating L2 observations and L1 measurements
- First principle Mathematical definition and description
- Practical constraints and working equations
- Parametric analysis of your NEOMI (based on simulated/synthetic or theoretical data. E.g.: What are the boundaries? What will break it? When will it work? When will it fail? What are the constraints?)
- Numbered measurements requirements (applicable at L1b), their justification and traceability to the observations
- NEOMI L1b product description

Vision of your NEOMI idea in space

- Assumptions for your NEOMI in space
- Description of your NEOMI measurement idea in Space and potential remote sensing technique options for space implementation of your NEOMI

Critical assessment of your NEOMI

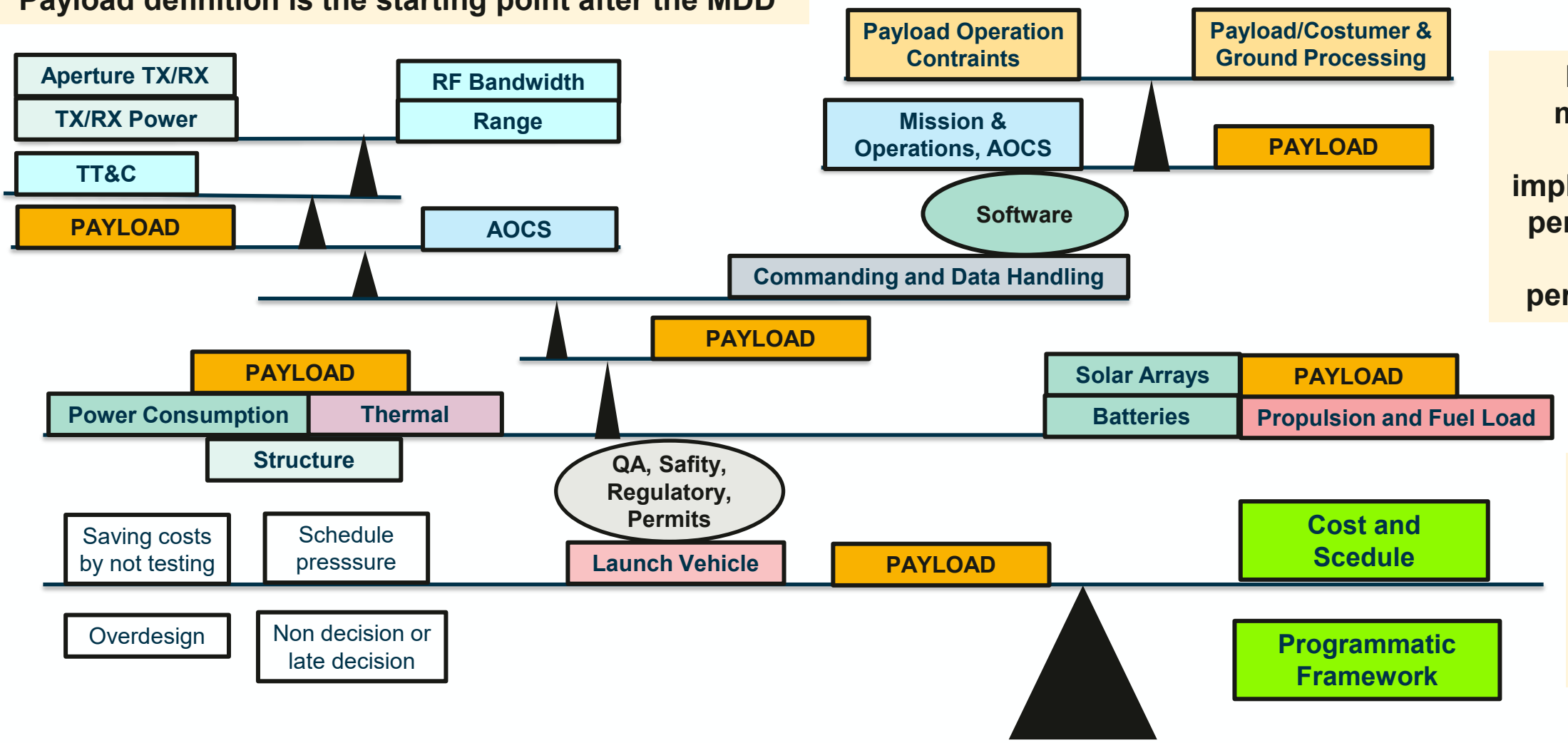


- Strengths, weaknesses, opportunities, and threats analysis of your NEOMI.
- Scientific risks and mitigation options for your NEOMI
- Scientific Impact of your NEOMI with user applications examples
- Uniqueness and Complementarity to state of the art
- Scientific roadmap of activities considered necessary to reach SRL=4.

Why is a Mission Description Document so important?

Mission Definition Document … what next and why so important

Payload definition is the starting point after the MDD



Balance mission's design implementation performance, against perturbations

Desired Science vs Cost of acquiring the Science


Over to you…

Panel Summary