

# Strategic Plan for the Scientific Programme

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**Günther Hasinger**

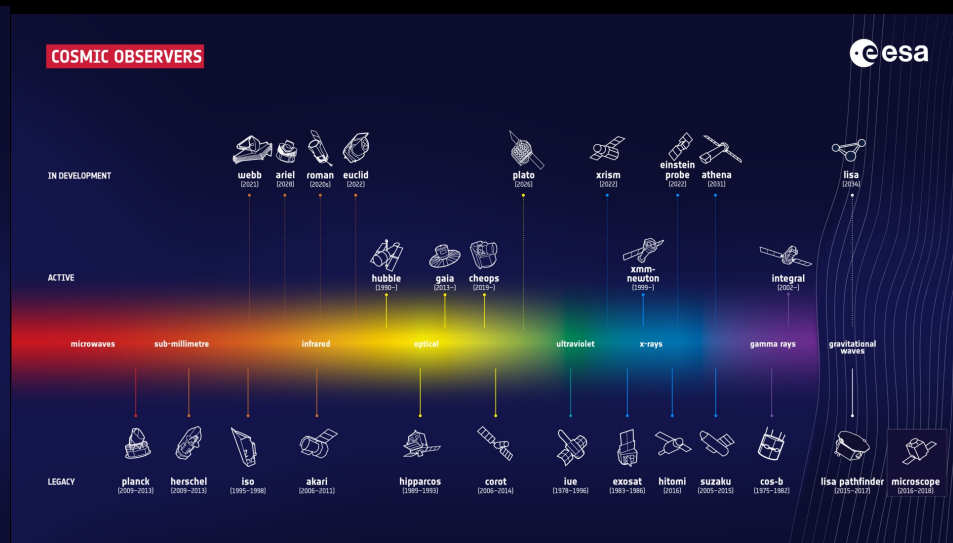
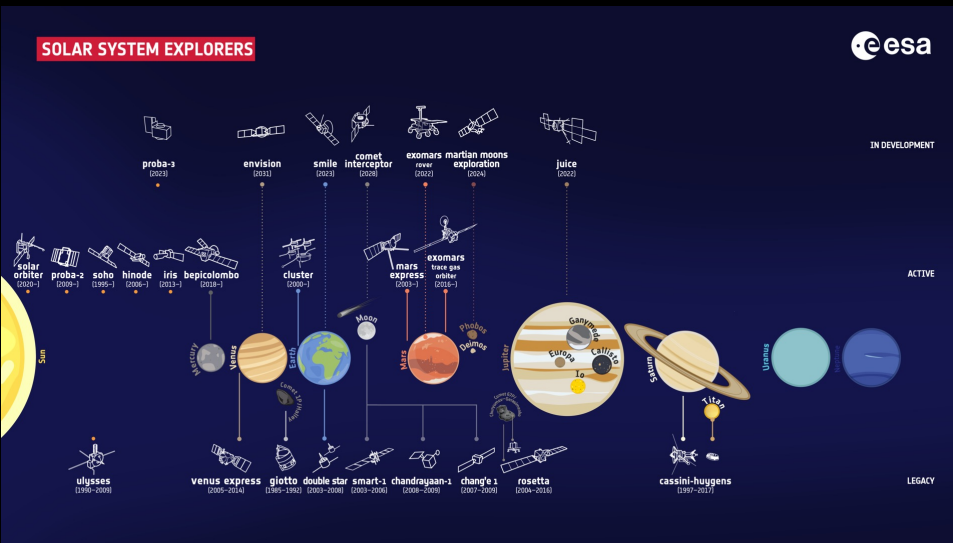
Director of Science

**ESSC Meeting**

1. 12. 2021



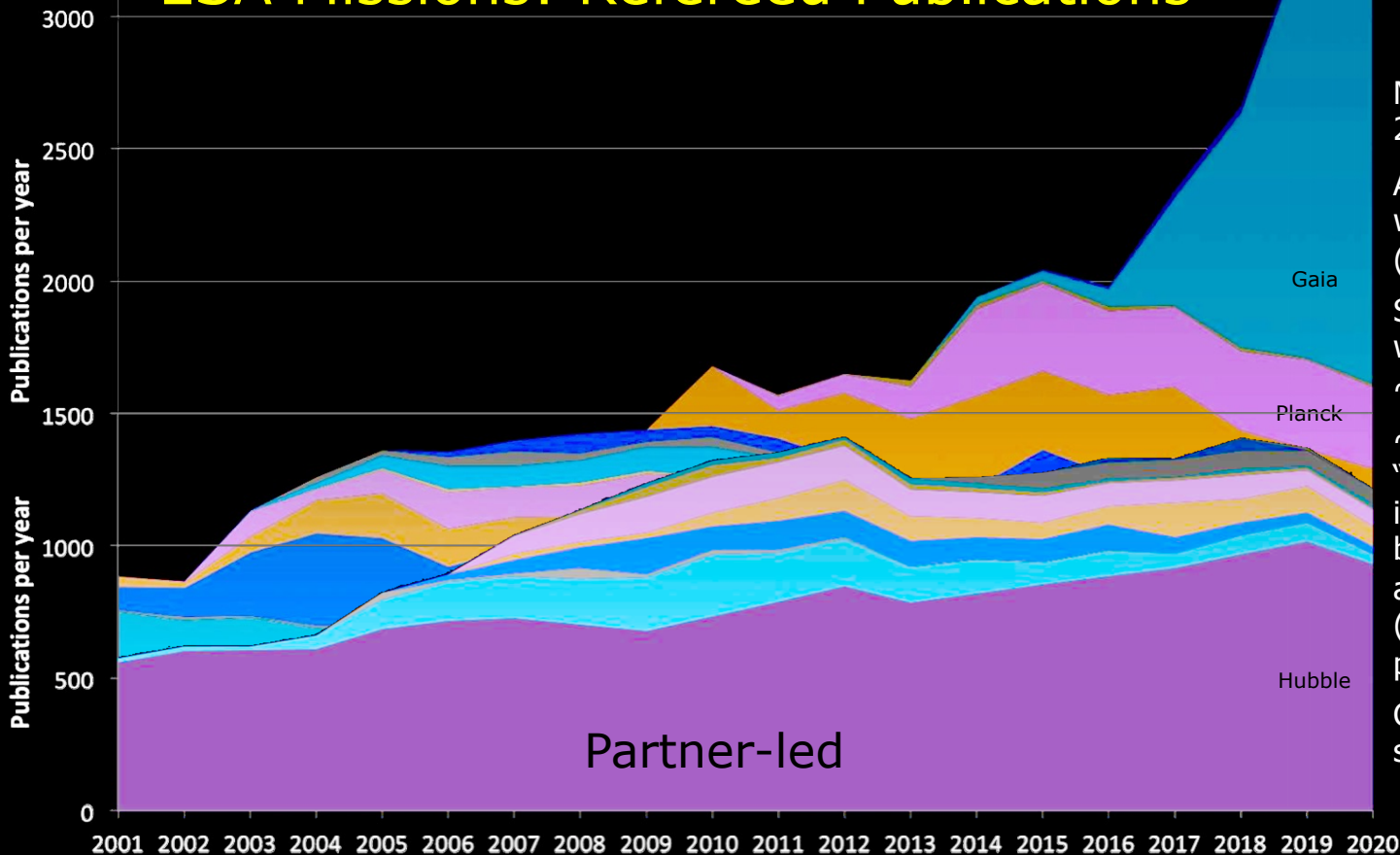
# ESA Scientific Programme Fleet



14 missions in orbit; 16 missions in preparation; 22 in legacy phase  
 ... standing on the shoulders of giants! ...  
 Large majority of these missions is done in international cooperation



# ESA Missions: Refereed Publications



Most papers ever in 2019&2020 (3357)

About half of these were from Gaia (1668)

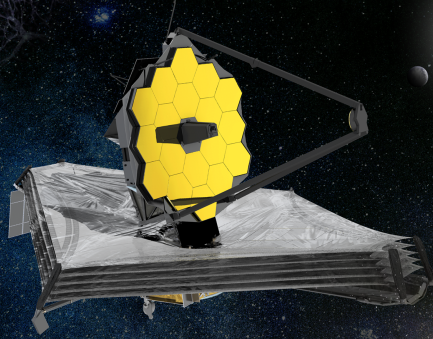
Strong positive trend with doubling time  $\sim 8$ yr

$\sim 11\%$  of worldwide "market share", including all ground based and theoretical astrophysics (15% including partner missions).

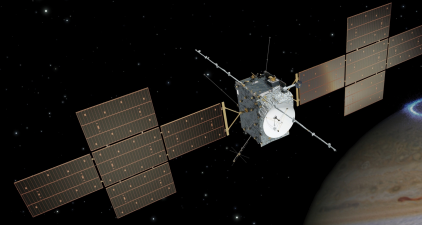
Citation impact strongly increasing.



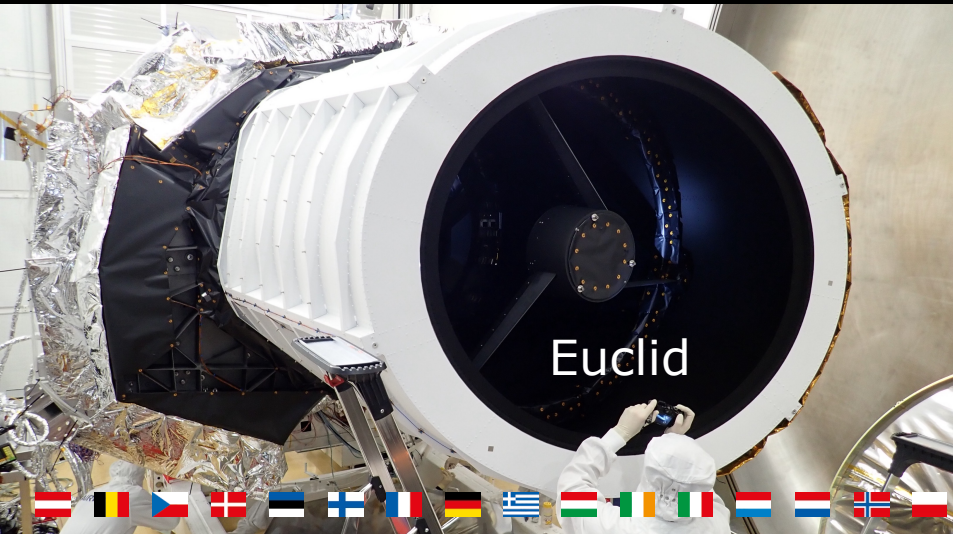
# Projects in Preparation



Webb



JUICE



Euclid



PLATO

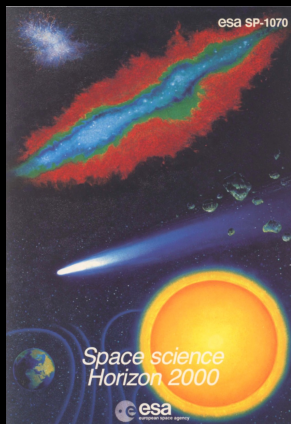




# Scientific Programme Strategic Planning



Cornerstone missions: SOHO; Cluster/Cluster II;  
XMM-Newton; Rosetta; Herschel  
Medium-sized missions: Huygens (Cassini);  
INTEGRAL; Planck

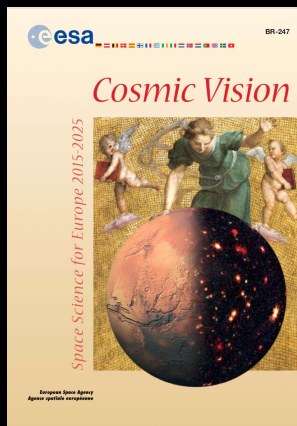


1984



1995

Gaia; LISA Pathfinder; BepiColombo



2005

L-class missions: JUICE [L1];  
Athena [L2]; LISA [L3]  
M-class missions: Solar Orbiter  
[M1]; Euclid [M2]; PLATO [M3];  
ARIEL [M4]; Envision [M5]  
S/F-class missions: CHEOPS  
[S1]; Comet Interceptor [F1]  
ESA-CAS mission: SMILE



2021



# Voyage 2050 sets sail



Moons of the  
giant planets

From temperate  
exoplanets to the  
Milky Way

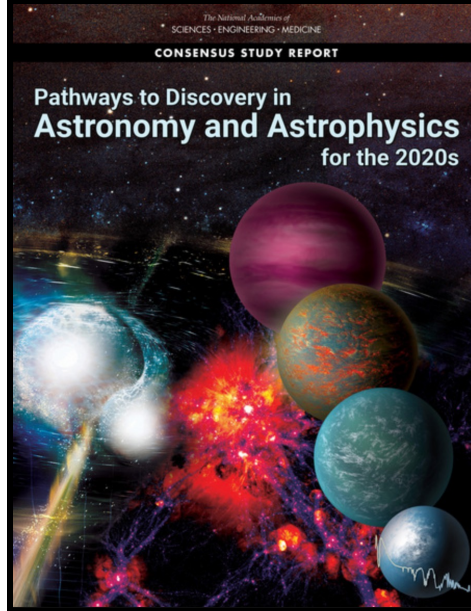
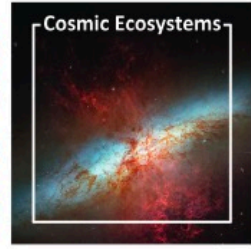
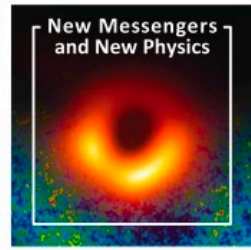
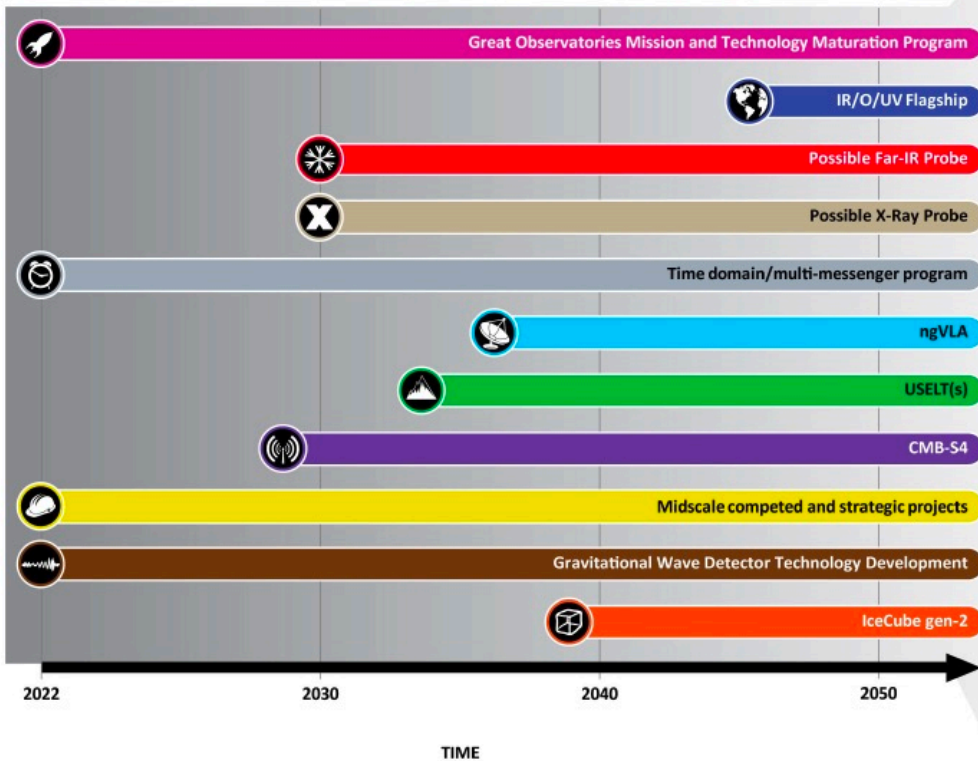
New physical probes  
of the early Universe

**Possible Technology development:** cold atom interferometry, X-ray interferometry, new power and heat sources, cryogenic sample return, solar sails  
**Member State provision of payloads** is a key enabler and will need a new paradigm to be addressed at CM22





# NAS Astro2020 Decadal Survey



# Science Programme: towards CM22

## Process

- SSAC discussed the new long-term implementation plan in October
- SPC workshop co-developed the plan in early November
- HoD workshop in early December: present possible content, feedback
- DG's proposal to be discussed in CWG in March subsequently

## Content

- DG wishes to propose a 5% p.a. cash increase over 3 years. It enables:
  - Implementation of Voyage 2050 long-term plan including NASA cooperation
  - Implementation of current missions (Athena, LISA, PLATO, etc.) with much larger ESA role (*some 500 M€ in P/L costs being taken over*)
  - Strong support to payloads for later missions
  - Line of modestly sized missions ("F missions")
  - *Work towards the Icy Moon Sample Return Inspirator*



# Proposed Strategic and Long-Term Planning Exercise



2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041

Strategic Plan Bottom-up Process

Cosmic Vision

Voyage 2050

Ministerial Meetings with Community Review: 3-yr LTIP update

SPC and Advisory Structure: Yearly LTIP review

Bepi Solo

JWST EUCLID JUICE

PLATO

ARIEL

EnVision

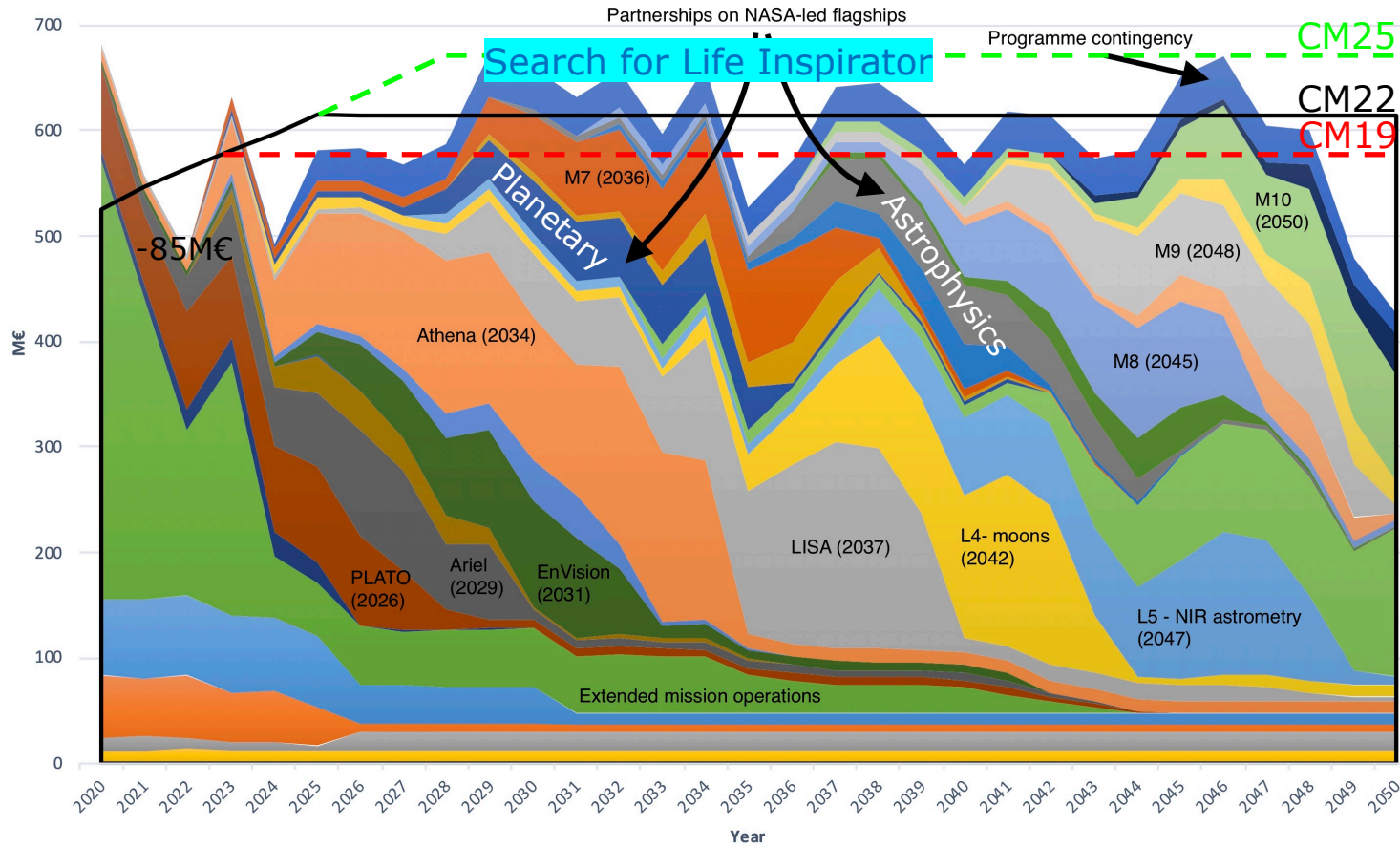
ATHENA

M7 LISA

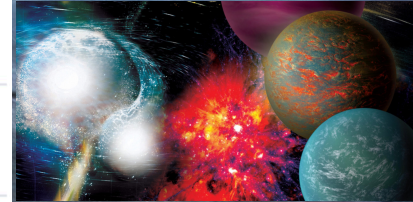
M8 L4



# CM22 Long-term Implementation Plan



ESA Voyage 2050





# Voyage 2050 Long-Term Implementation Plan



Name	CM19	CM22	CM25	Number
Mission Extensions	-	+	+	
EnVision	2031	2031	2031	1
F2	2031	2031	2031	2
Athena	2034	2034	2034	3
NASA Planetary	-	2035	2035	4
M7	2036	2036	2036	5
F3	-	2036	2036	6
LISA	2038	2037	2037	7
M8	2041	2040	2040	8
F4	2041	2040	2040	9
L4	2044	2043	2041	10
L4 Inspirator			2041	
M9	2045	2044	2044	11
F5	2045	2044	2044	12
NASA Astrophysics	-	2046	2046	13
M10	2048	2047	2047	14
F6	-	2047	2047	15
L5	2051	2050	2050	16
M11	2052	2051	2051	17
F7	2052	2051	2051	18
M12	2055	2054	2054	19
F8	2055	2054	2054	20
L6	2058	2057	2057	21

## Voyage 2050:

- 3 L Missions
- 5-6 M Missions
- 7 F Mission
- 2 NASA Flagships
- 1 Inspirator

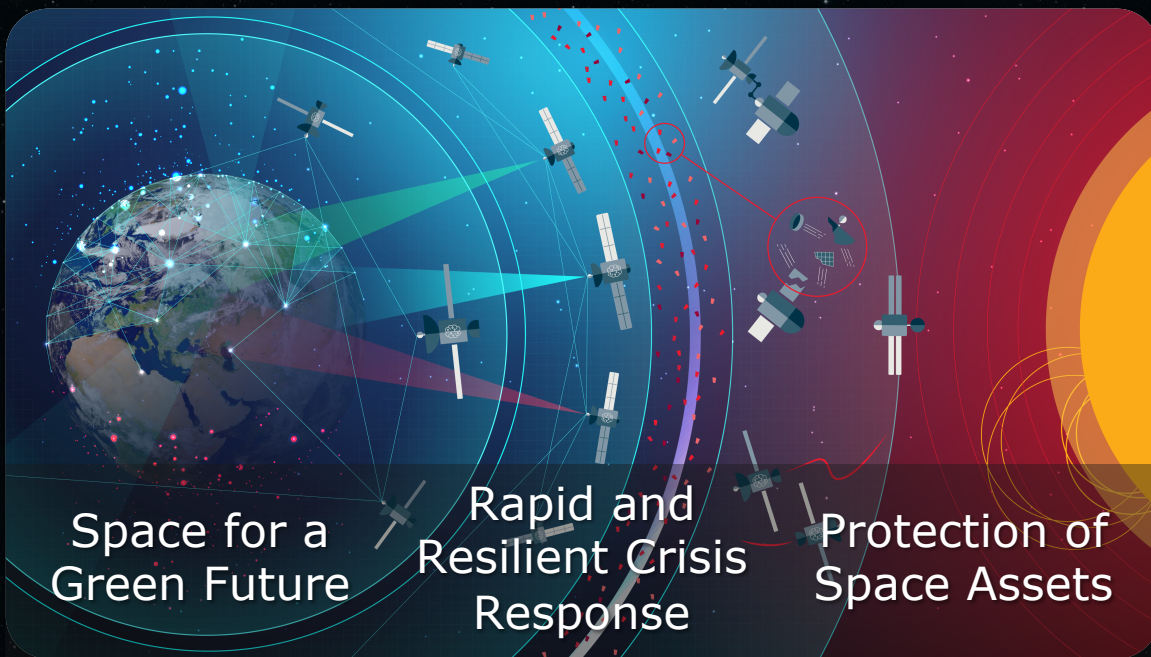
~1 launch / 15 months  
(> Cosmic Vision)



# IMM21 Matesinhos & Space Summit 2022



16 February 2022 in Toulouse, France



## 3 Accelerators

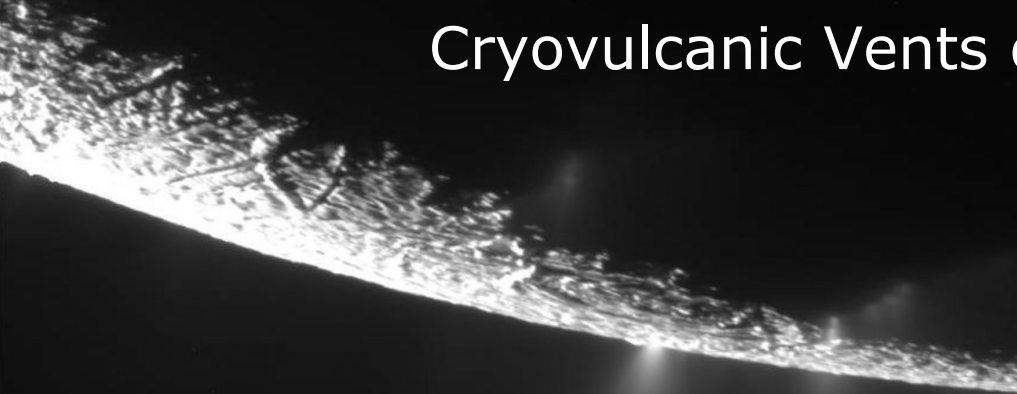


## 2 Inspirators

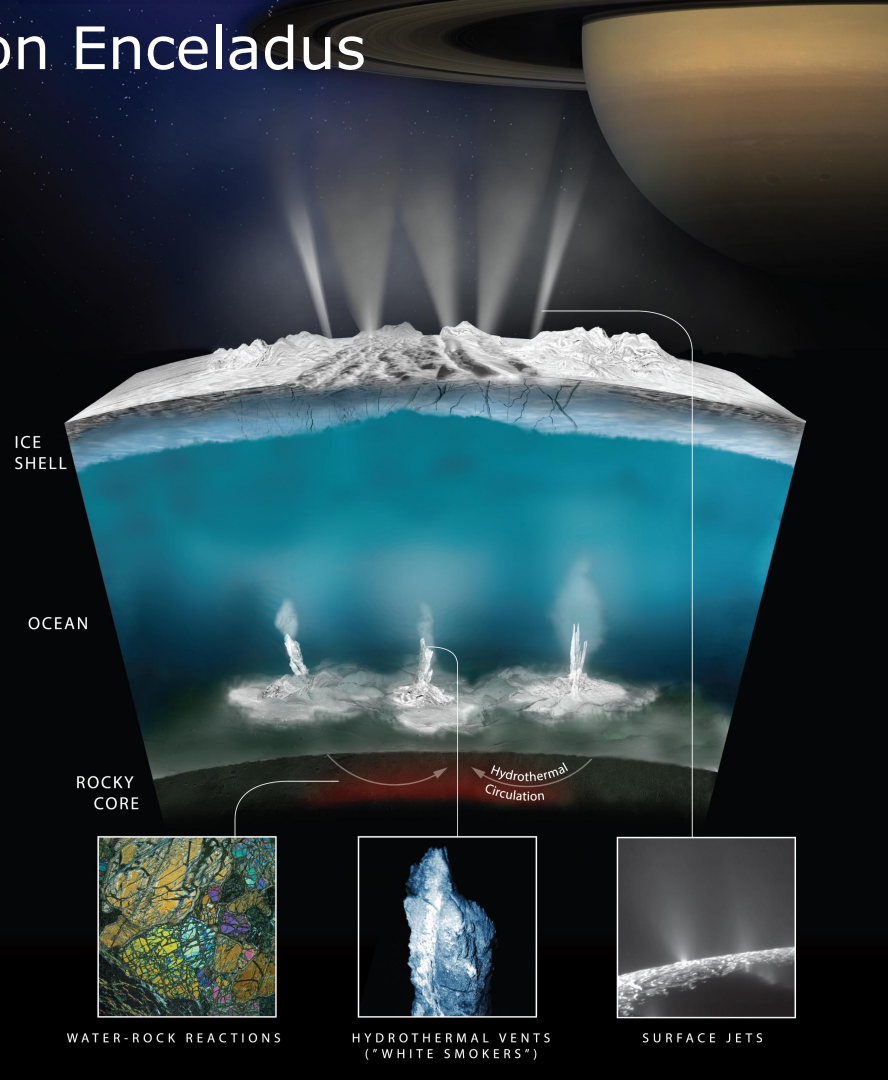
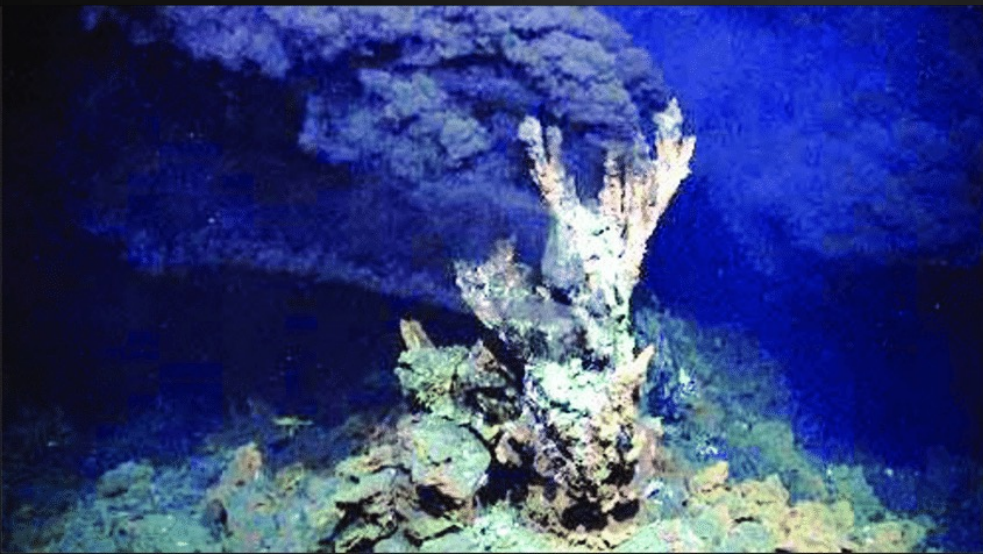




# Cryovolcanic Vents on Enceladus



Origin of life in hydrothermal vents?



# Inspirator: Icy Moon Sample Return Mission

- Outstanding science return
- Breakthrough technology development
- Profound source of inspiration
- Accelerate Voyage 2050 implementation

**Is there life out there?**



# MISSION TO ENCELADUS

## Enceladus Sample Return facts

9.55 au

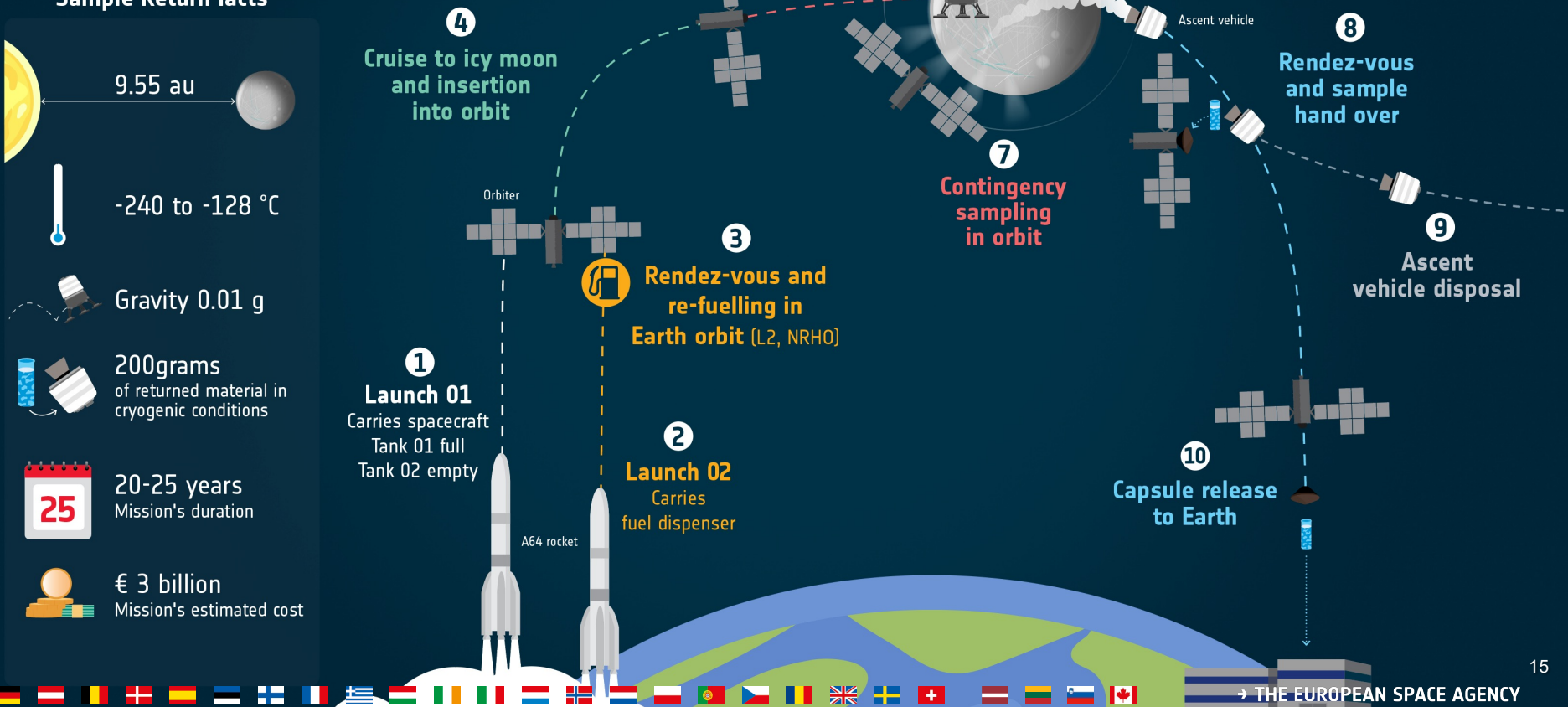
-240 to -128 °C

Gravity 0.01 g

200grams of returned material in cryogenic conditions

20-25 years  
Mission's duration

€ 3 billion  
Mission's estimated cost



# Thank you very much!

