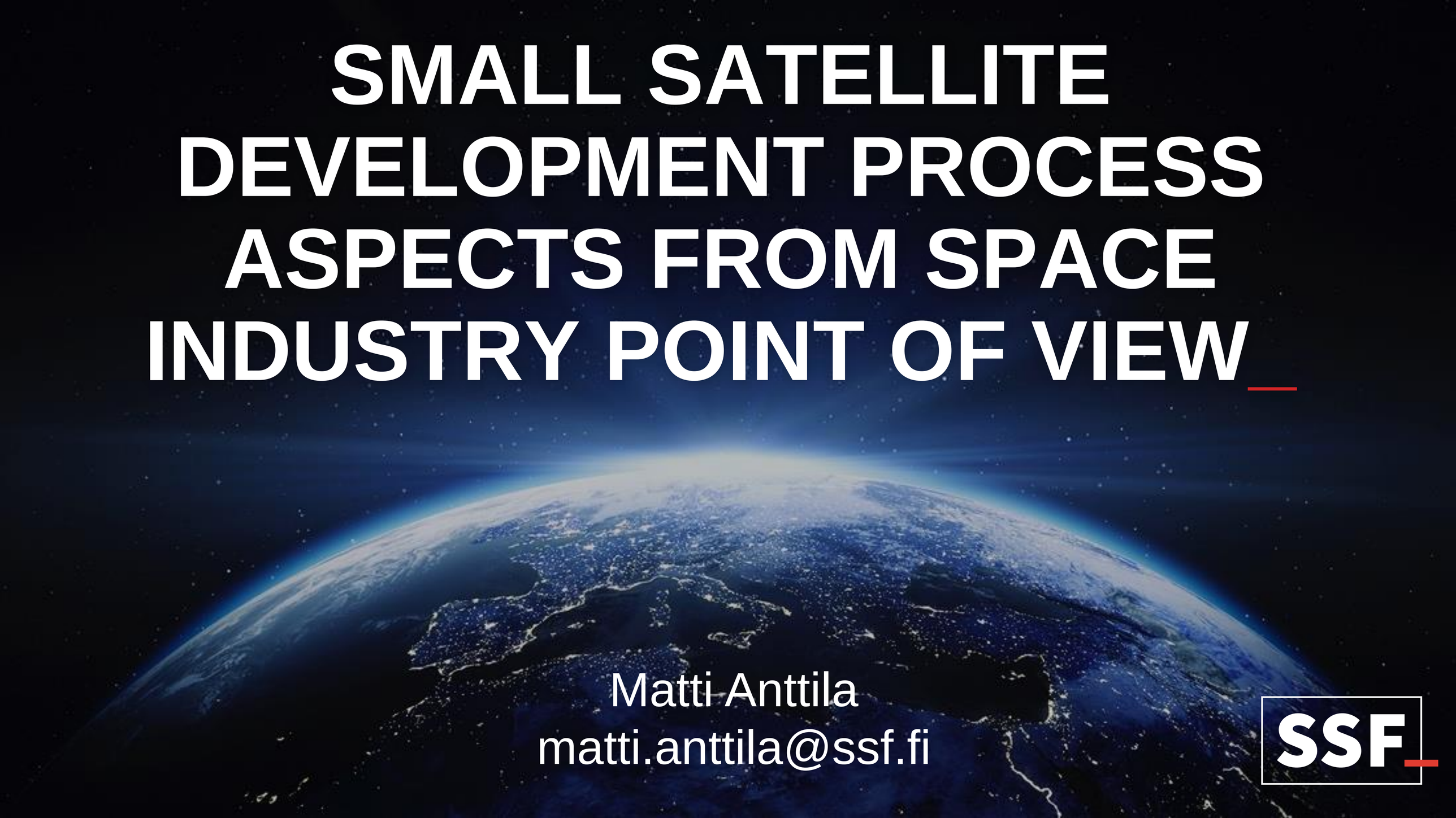
SMALL SATELLITE DEVELOPMENT PROCESS ASPECTS FROM SPACE INDUSTRY POINT OF VIEW



Matti Anttila
matti.anttila@ssf.fi

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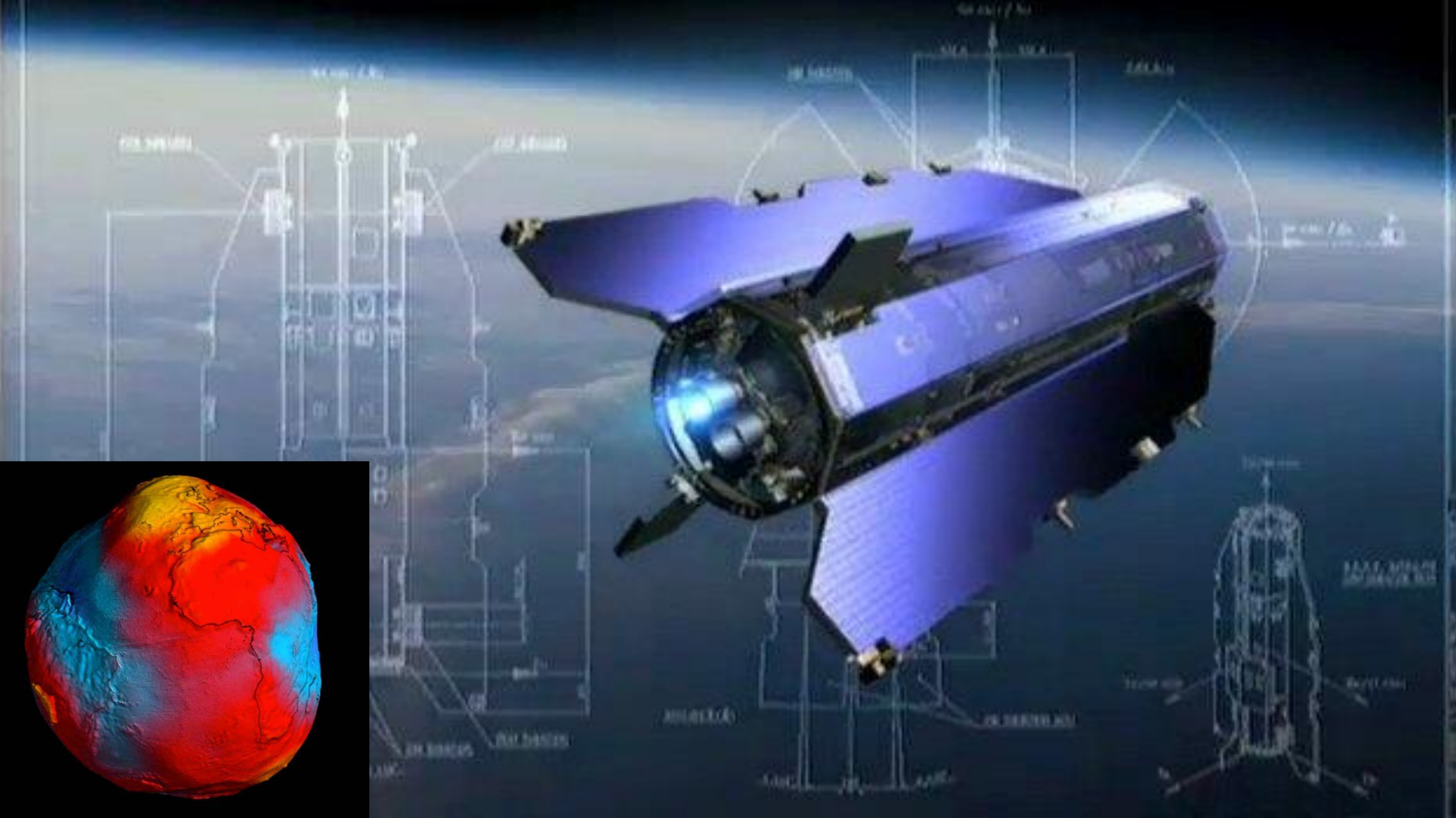
SSF STARTED FROM A
SPACE MISSION IN 1989



SATELLITES ARE HIGHLY CUSTOMIZED

~~PRODUCTS~~ PROJECTS

http://emits.sso.esa.int/emits/owa/emits.main — EMITS Invitation To Tender ...

esa emits

ENTITIES | LOGIN | ESA Home Page | Industry Information | Entity Registrati

User: Guest

ews
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pen Invitations to Tender
Ordered by Open Date
Ordered by Closing Date
By Keyword
Global List
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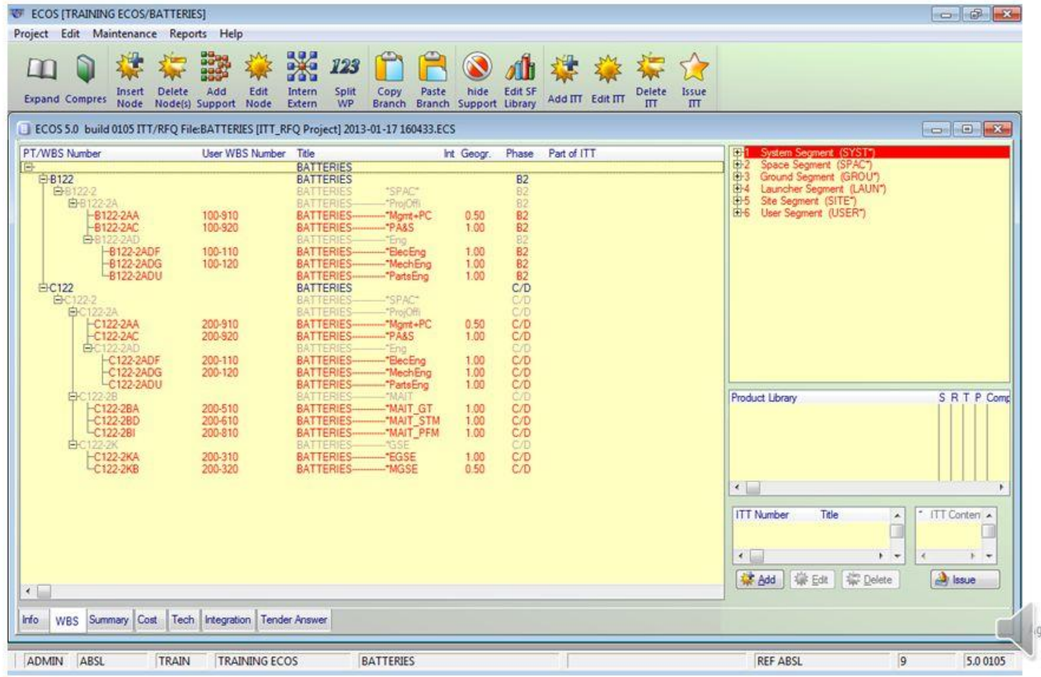
COS Resources
ow to do Business with ESA

13	AO8891	(From 31/10/2017 to 16/02/2018 13:00:00, Act.Ref.: 17.1AA.01)
14	AO9053	EXPRO+ NAVISP ELEMENT 1 (NAVISP-EL1-003): SYSTEM SUITABILITY STUDY F (From 19/12/2017 to 15/02/2018 13:00:00, Act.Ref.: 17.154.05)
15	AO9126	VERY HIGH RESOLUTION (VHR) IMAGE 2018 (From 10/11/2017 to 15/01/2018 13:00:00, Act.Ref.: 17.187.09)
16	AO8880	HIGHLY EFFICIENT HEAT EXCHANGERS FOR CROSSING HEAT PIPES (ARTES AT (From 11/01/2018 to 30/03/2018 13:00:00, Act.Ref.: 17.1TT.21)
17	AO9132	PHASE A/B1 OF POLAR ICE AND SNOW TOPOGRAPHIC MISSION (From 07/11/2017 to 22/01/2018 13:00:00, Act.Ref.: 17.156.13)
18	AO9079	NEW FRAME CONTRACT: NETWORK OPERATIONS CENTRE (NOC) SERVICES AT (From 08/11/2017 to 31/01/2018 13:00:00, Act.Ref.: 15.117.04)
19	AO8984	EUSO PHASE B2 EBB DESIGN, MANUFACTURE AND TEST EXPRO+ (From 31/07/2017 to 15/02/2018 13:00:00, Act.Ref.: 17.1PU.01)
20	AO9105	GROUND SEGMENT LIFE CYCLE ASSESSMENT METHODOLOGICAL AND QUANTIT (From 01/11/2017 to 01/02/2018 13:00:00, Act.Ref.: 17.138.03)
21	AO9173	GNC PRELIMINARY DESIGN FOR RENDEZVOUS AND DOCKING IN NRO ORBITS A (From 30/11/2017 to 14/02/2018 13:00:00, Act.Ref.: 17.1EC.04)
22	AO9181	ANNOUNCEMENT OF OPPORTUNITY : THIRD CALL FOR OUTLINE PROPOSALS UN LITHUANIA (From 08/01/2018 to 09/03/2018 13:00:00, Act.Ref.: 17.179.04)
23	AO9121	HIGH ALTITUDE PSEUDO SATELLITES IN SUPPORT OF ESA EARTH OBSERVATIO (From 21/12/2017 to 22/02/2018 13:00:00, Act.Ref.: 17.18I.03)
24	AO9136	LISA PHASE-A SYSTEM STUDY FOR A GRAVITATIONAL WAVE OBSERVATORY (From 20/12/2017 to 28/02/2018 13:00:00, Act.Ref.: 17.164.07)
25	AO9186	PHASE A/B1 OF PASSIVE MICROWAVE IMAGING MISSION (CIMR) (From 15/12/2017 to 23/02/2018 13:00:00, Act.Ref.: 17.156.19)
26	AO9103	EXTENSION OF THE HIGH-FIDELITY RE-ENTRY BREAK-UP SIMULATION SOFTWA

160 !

ECOS - Building the PT/WBS with Support Functions

esa



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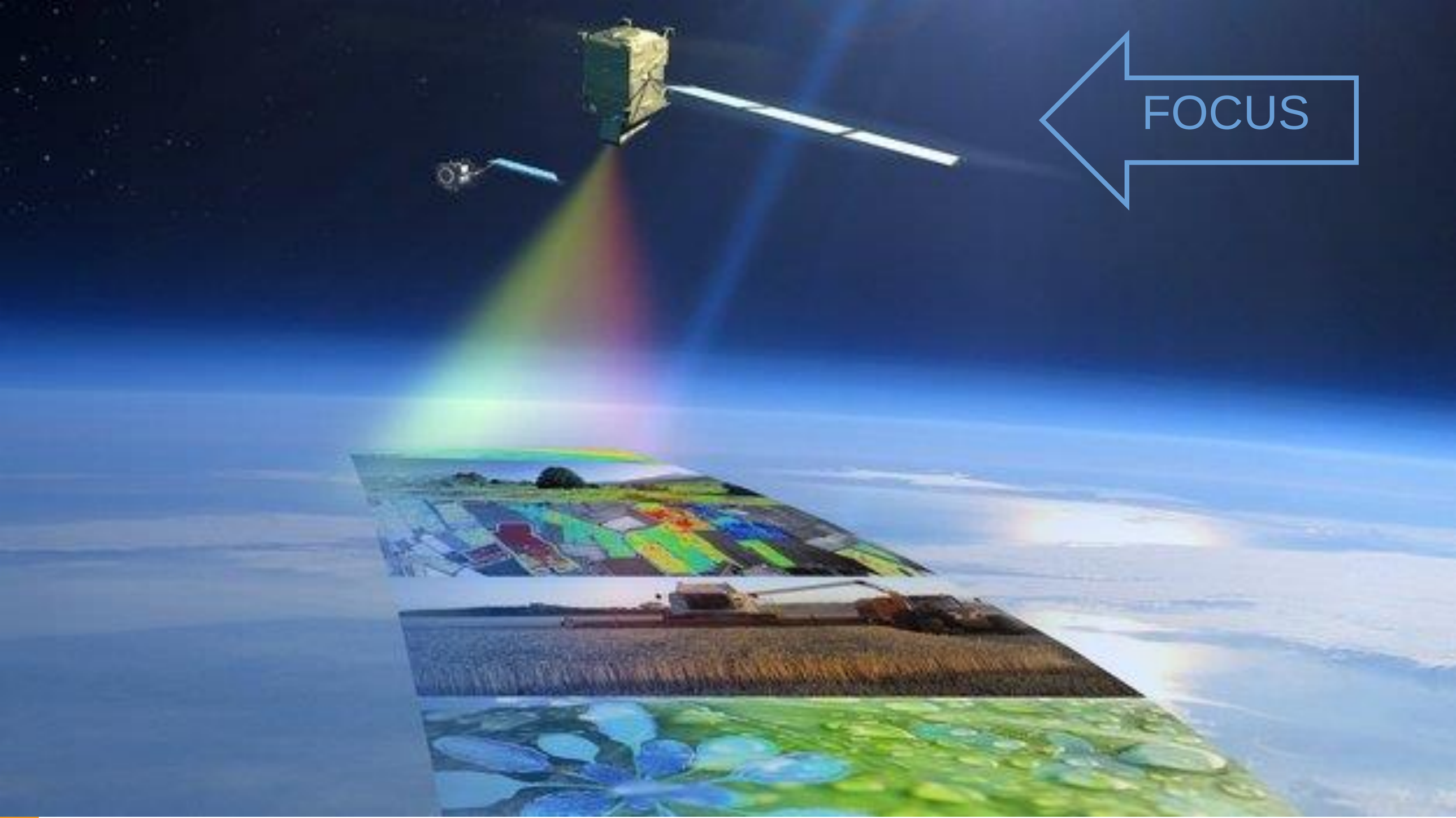
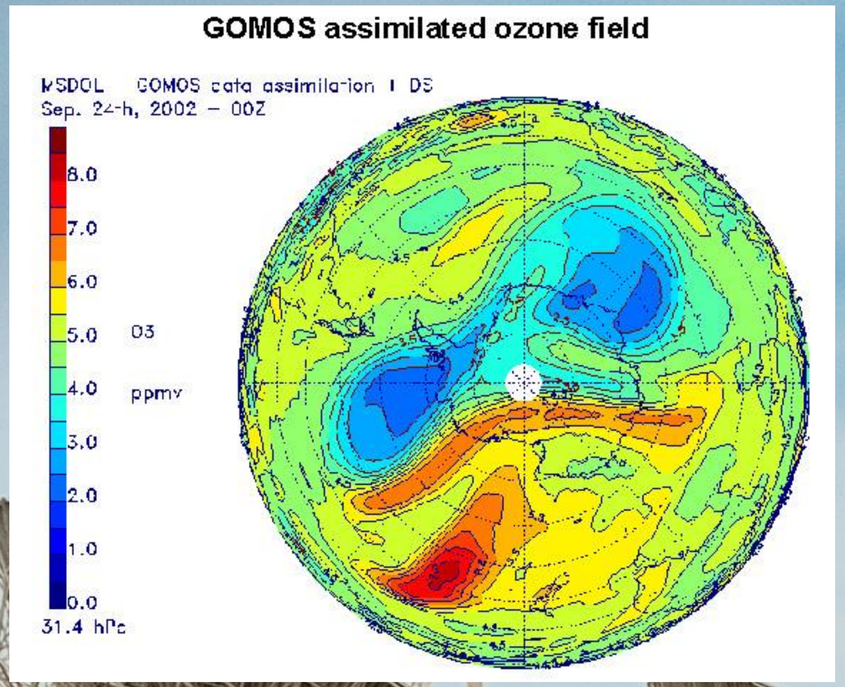

FOCUS

THE INTELLIGENCE
SHOULD BE IN
DOWNSTREAM
SERVICES_
SSF_


GOMOS assimilated ozone field
MSDOL GOMOS data assimilation : DS
Sep. 24-h, 2002 – 00Z
8.0
7.0
6.0
5.0
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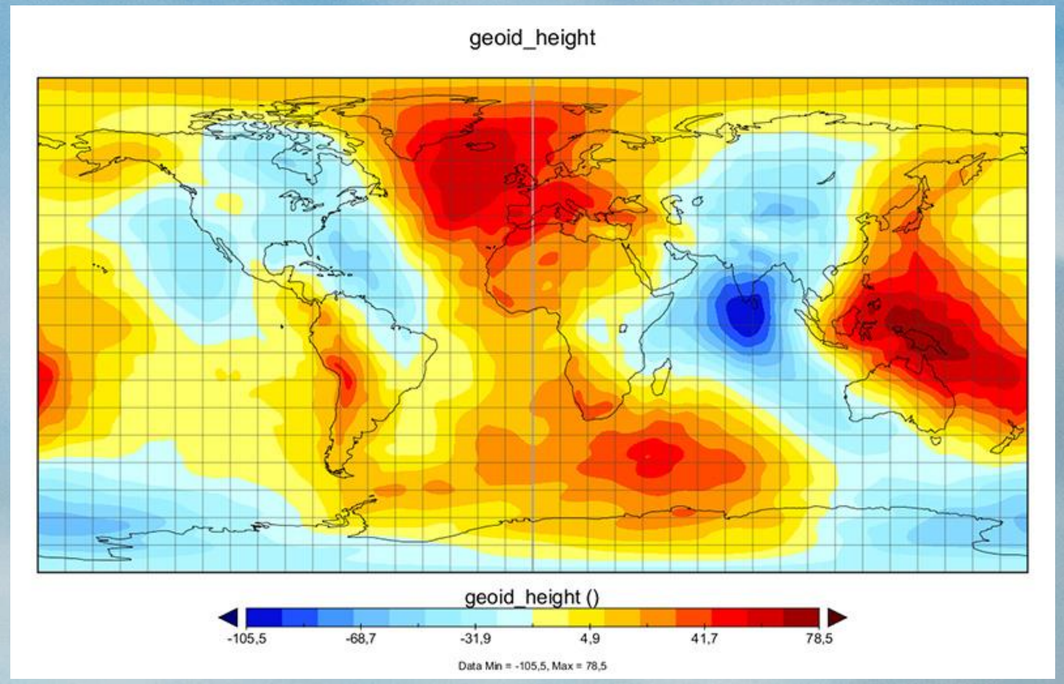
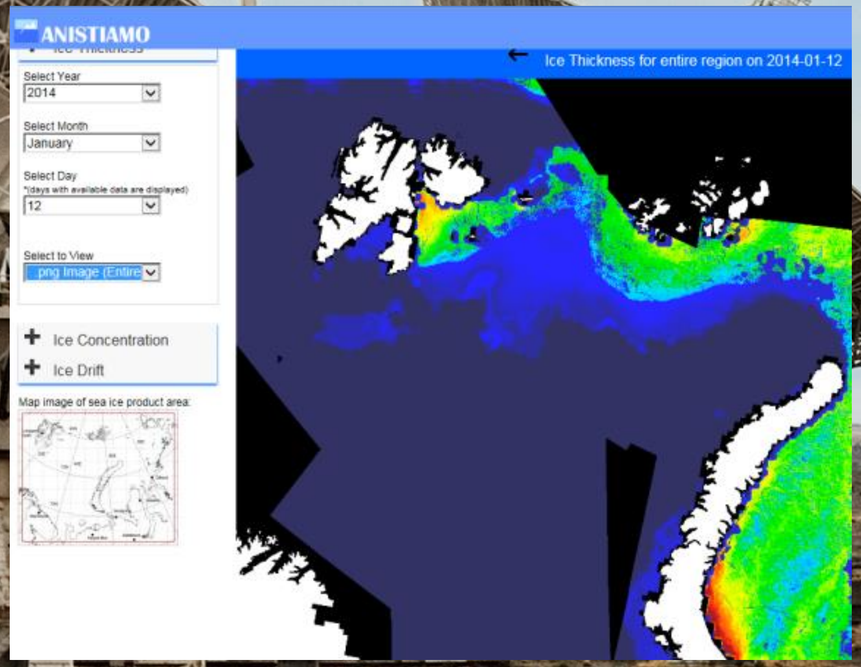
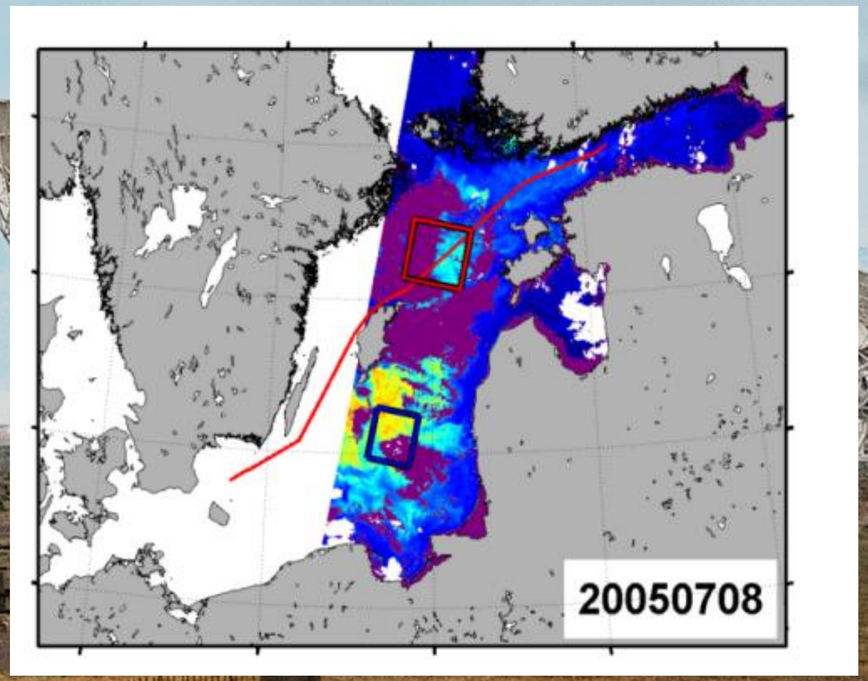
3.0
2.0
1.0
0.0
O3
ppmv
31.4 hPa


geoid_height
geoid_height ()
-105,5
-68,7
-31,9
4,9
41,7
78,5
Data Min = -105,5, Max = 78,5


ANISTIAMO
Ice Thickness for entire region on 2014-01-12
Select Year
2014
Select Month
January
Select Day
*(days with available data are displayed)
12
Select to View
_png Image (Entire
Ice Concentration
Ice Drift
Map image of sea ice product area:


20050708

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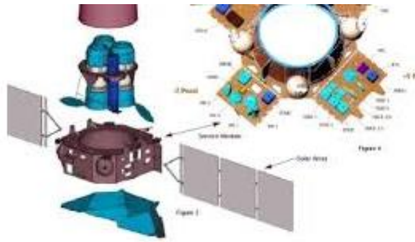
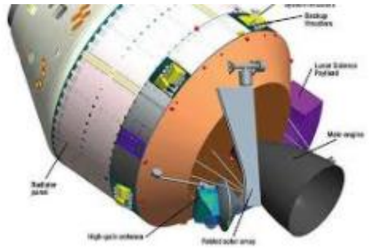
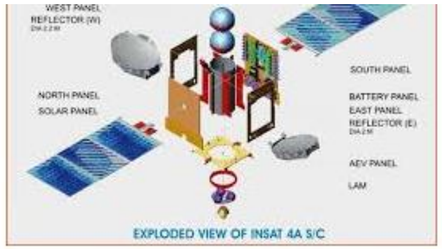
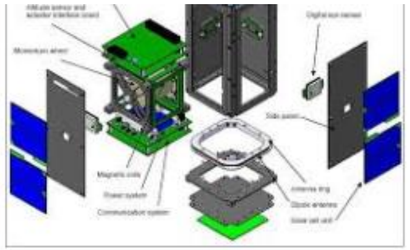
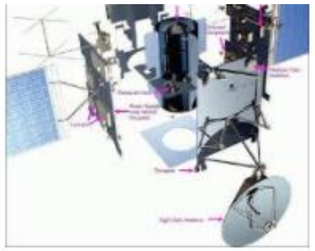
… so when the sensors are considered as the building blocks of the upstream component …

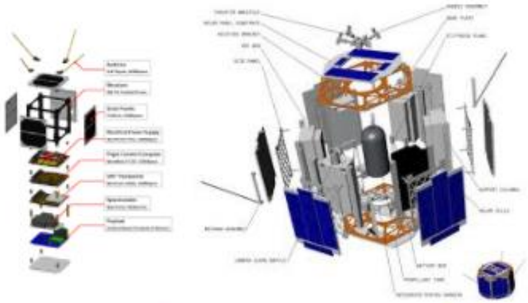


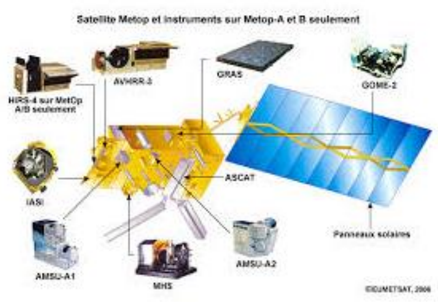


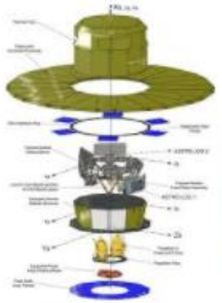


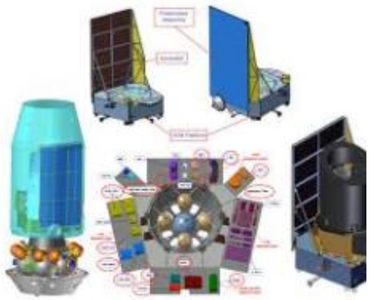


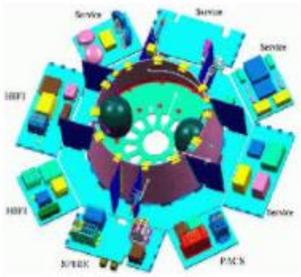


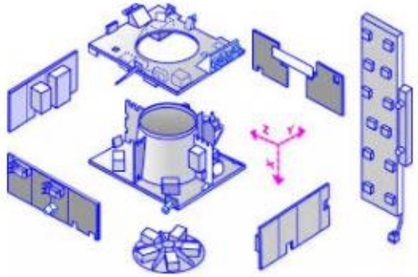


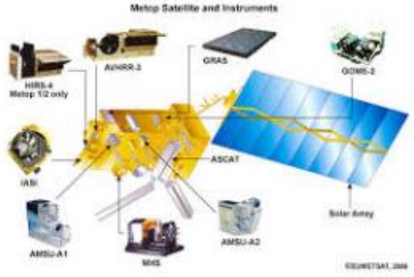


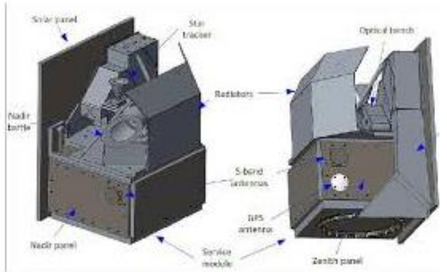


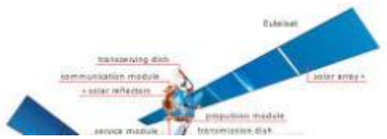


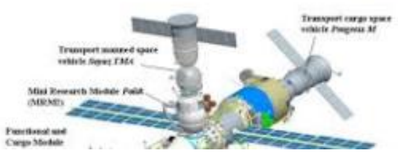


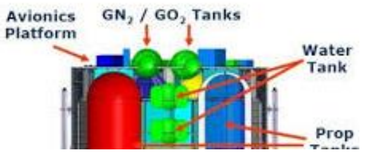












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… why not to focus on productization of the (small sat components):

(a more cool example)

ESTABLISH A CATALOGUE OF BUILDING BLOCKS BY COMBINING “OLD” AND “NEW” SPACE_

HIGH RELIABILITY SYSTEMS

- Control *(already in ESA’s GSTP plan!)*
- Power
- AOCS
- TC/TM

TEST AUTOMATION

- Simulators
- Simulation environments
- Build systems

DATA PROCESSING SYSTEMS

- OB instrument data processors
- GS data processors with multi-I/F
- Processing algorithm libraries
- TC/TM Database
- TC/TM analysers, AI from HK?

APPLICATION SOFTWARE

- Payload data converters (drivers)
- Calibration systems
- TC/TM libraries

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And not only the satellite components, but also the process, including validation_

Development Process

- Agile ECSS
- Continuous integration

Documentation

- Lightweight but thorough
- Shared access, transparent

Testing

- U+I+V Testing
- SW and HW simulators

Third party

- Independent verification and validation as a product

SUMMARY_

- **Space as a Service**
  - → Intelligence to downstream applications
- **Productization of the space component as much as possible**
  - → Cut costs and time
- **Productization of the development processes**
  - → ESA’s Agile processes good starting point
- **Even small and cheap missions can’t afford failures**
  - → Not only about low-cost, but wasting time and show-cases
- **It has started already**
  - → Could we find solutions TOGETHER?

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