Aalto University
School of Electrical
Engineering

Introduction to Space:
Space plasma physics

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Aalto University
School of Electrical Engineering

http://space.aalto.fi/

Contents

Three space plasma physics weeks, three topics:

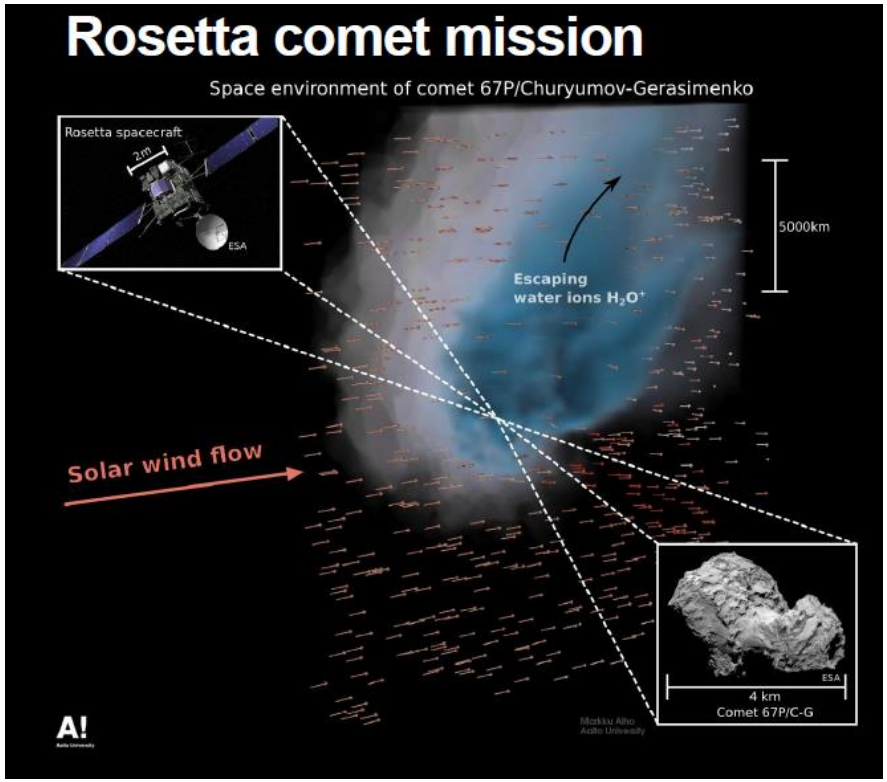
1. lecture week *(September 14 & 15)*
   - *Space plasma physics: Space plasma & Solar system plasma environments*
2. lecture week *(September 21 & 22)*
   - *Space plasma observations & instruments*
3. lecture week *(September 28 & 29)*
   - *Space plasma modelling & simulations*

1. Space science: Plasma environments in the Solar System

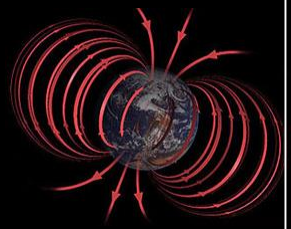
- *Science objective: How does flowing plasma interacts with Solar System objects?*

- *Space weather in the Solar System*

Example: Comet - solar wind interaction



1. Space plasma physics:
Plasma environments in the Solar System



Strength of the intrinsic magnetic field

GANYMEDE

MERCURY

Earth-like interaction

EARTH

JUPITER
SATURN
URANUS
NEPTUNE

Moon-like interaction

Comet-like interaction

Venus-like interaction

THE MOON

COMETS

MARS

TITAN

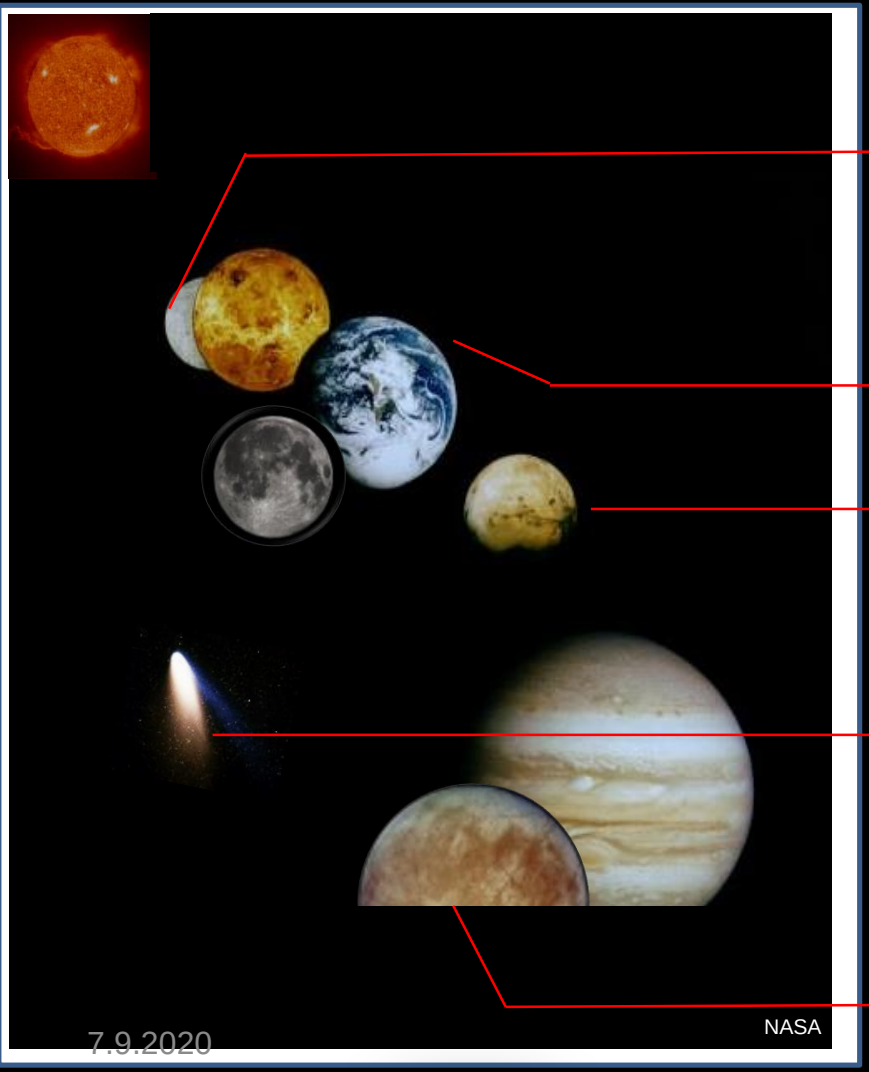
VENUS

Esa Kallio

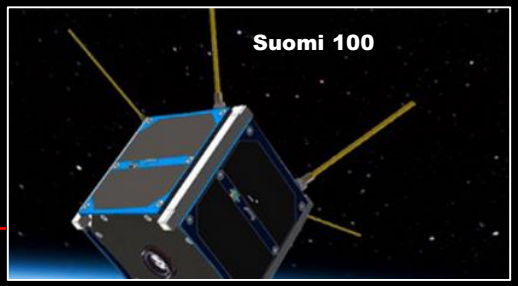
Density of the atmosphere/ionosphere

2. Space plasma observations & instruments

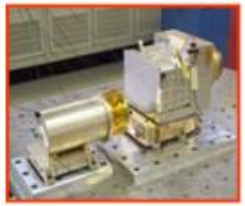
Aalto University: Co-I or PI status



SERENA / BepiColombo



ASPERA-3 / MarsExpress



ICA / Rosetta

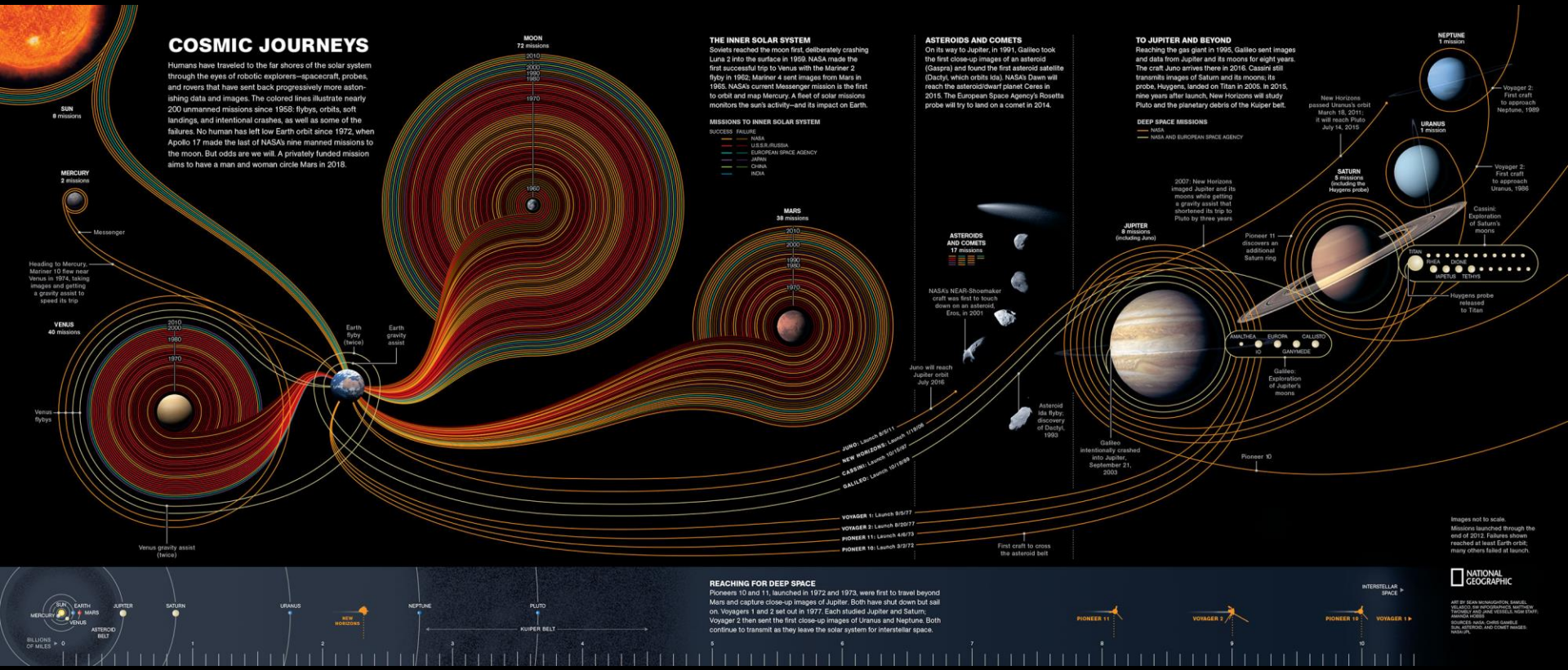
PEP / JUICE

PEP

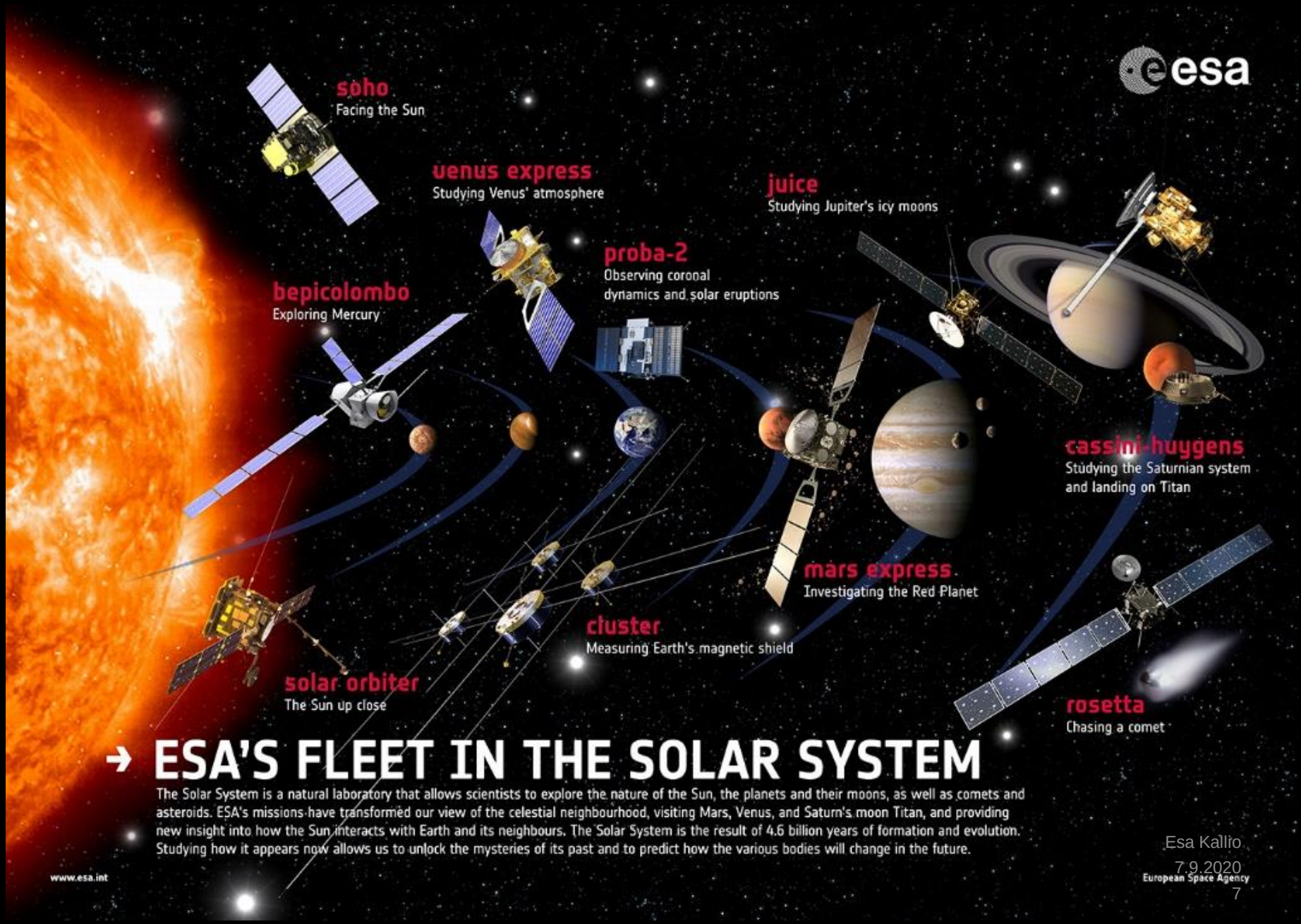
Esa Kallio

Lots of space missions

COSMIC JOURNEYS:
The colored lines illustrate nearly 200 unmanned missions at 1958 - end of 2014

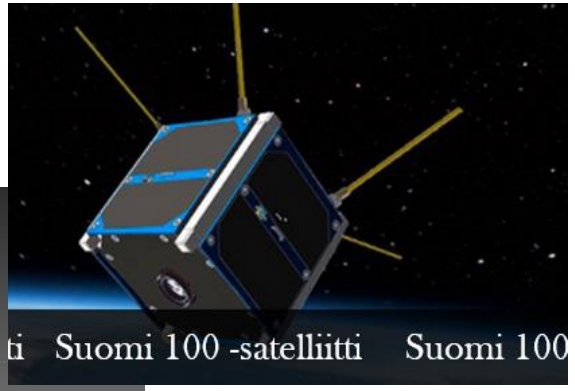


http://www.5wgraphics.com/img/newsletter/50-years-of-exploration.jpg

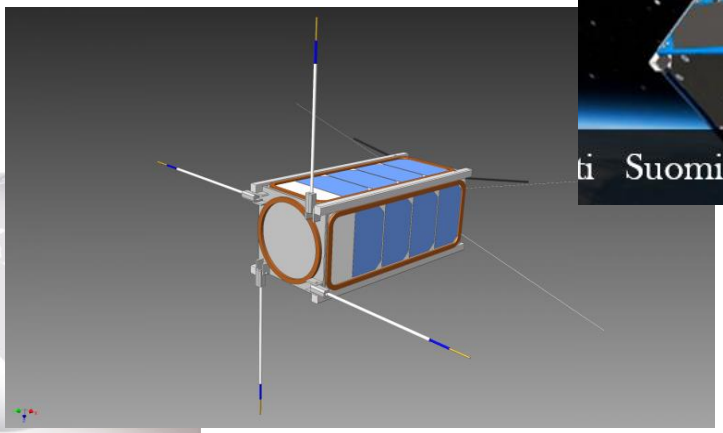

esa
soho
Facing the Sun
venus express
Studying Venus' atmosphere
juice
Studying Jupiter's icy moons
proba-2
Observing coronal dynamics and solar eruptions
bepicolombo
Exploring Mercury
cassini-huygens
Studying the Saturnian system and landing on Titan
mars express
Investigating the Red Planet
cluster
Measuring Earth's magnetic shield
solar orbiter
The Sun up close
rosetta
Chasing a comet
ESA'S FLEET IN THE SOLAR SYSTEM
The Solar System is a natural laboratory that allows scientists to explore the nature of the Sun, the planets and their moons, as well as comets and asteroids. ESA's missions have transformed our view of the celestial neighbourhood, visiting Mars, Venus, and Saturn's moon Titan, and providing new insight into how the Sun interacts with Earth and its neighbours. The Solar System is the result of 4.6 billion years of formation and evolution. Studying how it appears now allows us to unlock the mysteries of its past and to predict how the various bodies will change in the future.
www.esa.int
European Space Agency

Aalto University's cubesat program

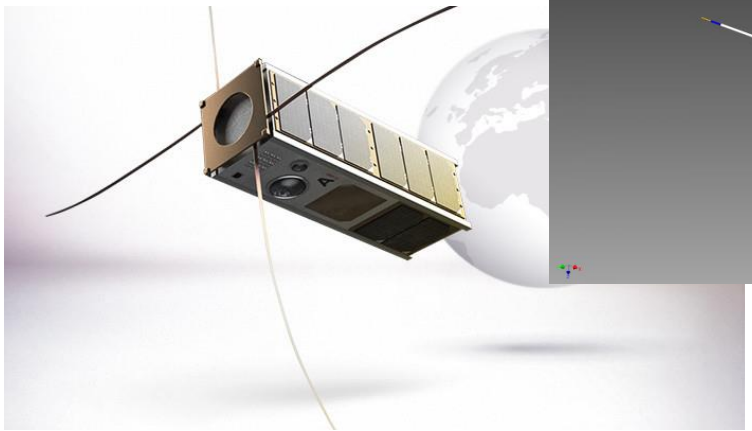
Suomi 100



Aalto-2



Aalto-1



6/2017

4/2017

12/2018

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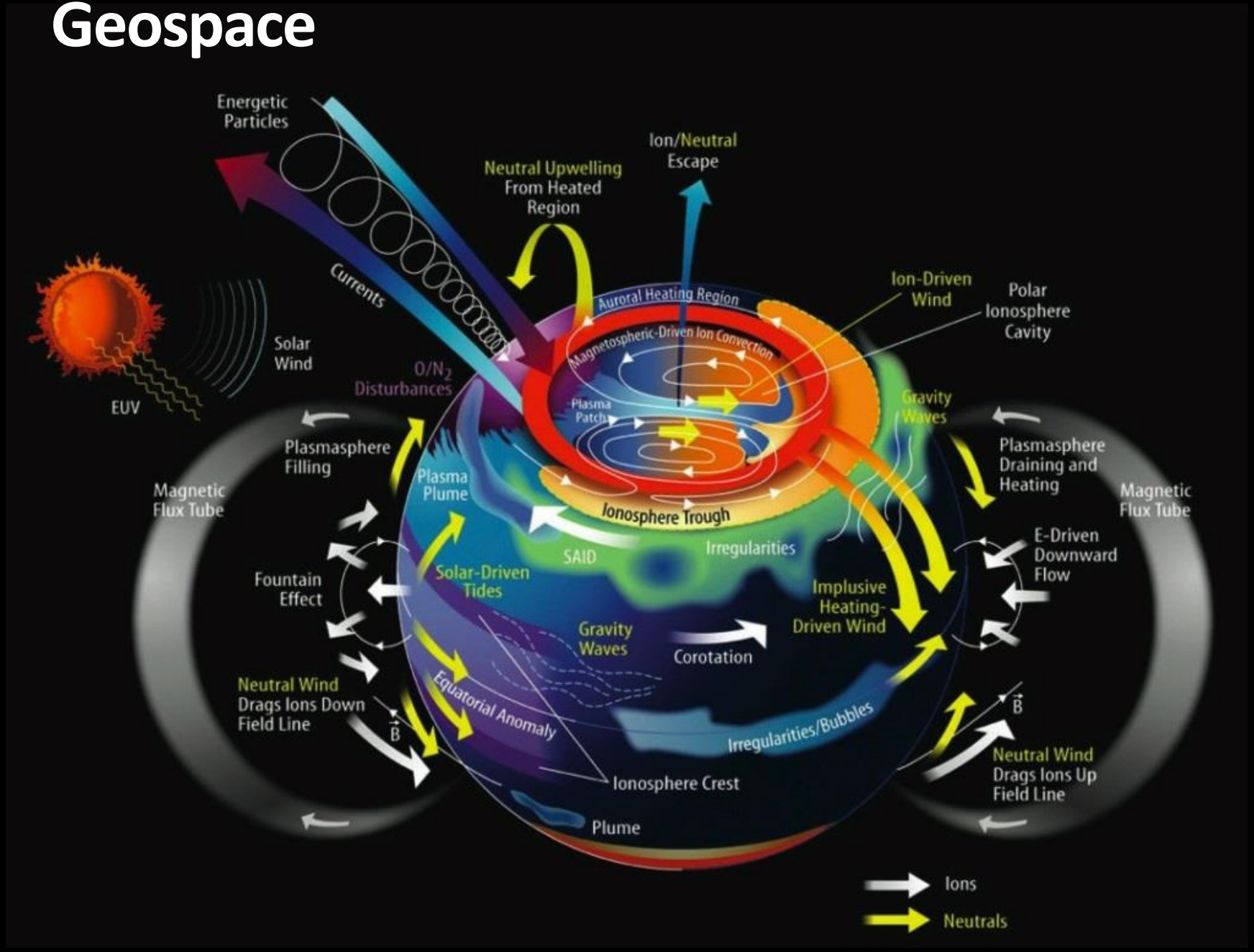
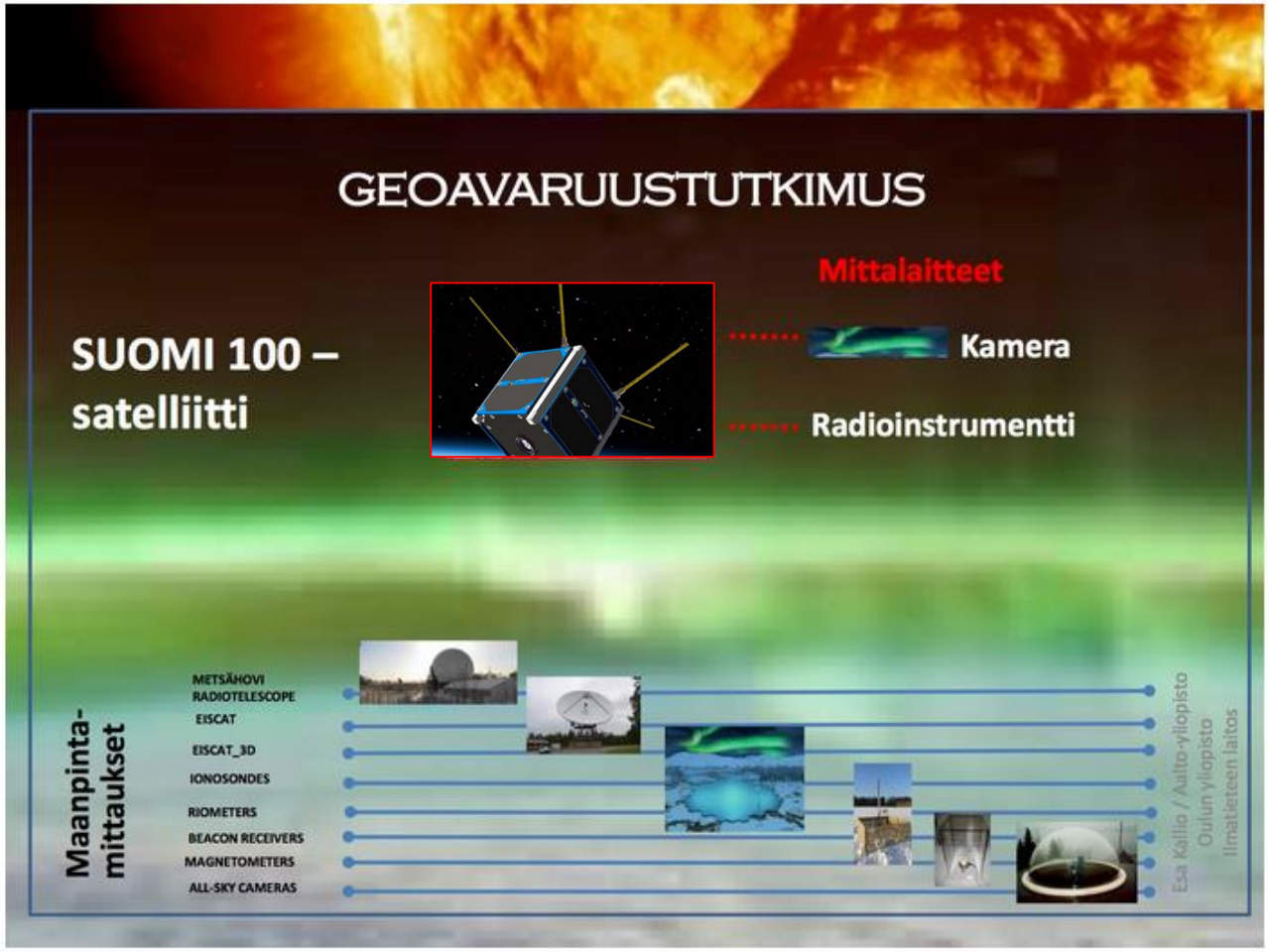
Geospace



www.ngdc.noaa.gov/stp/space-weather/online-publications/stp_division/stp_presentations/2015/ssw_2015

Geospace reseach (geoavaruustutkimus)

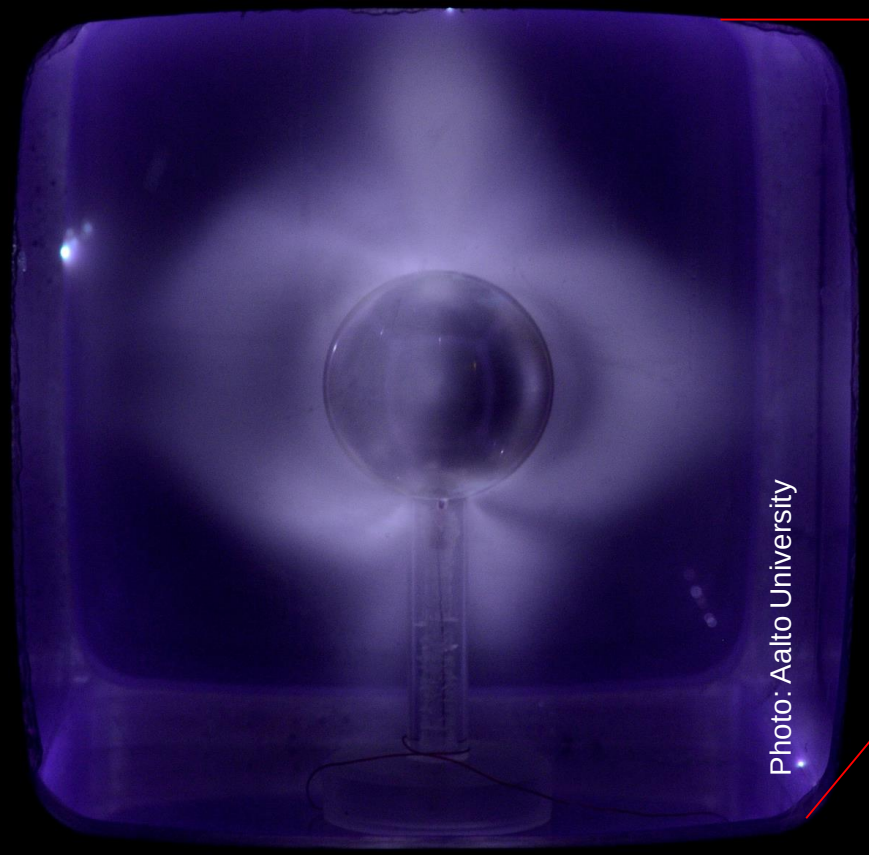


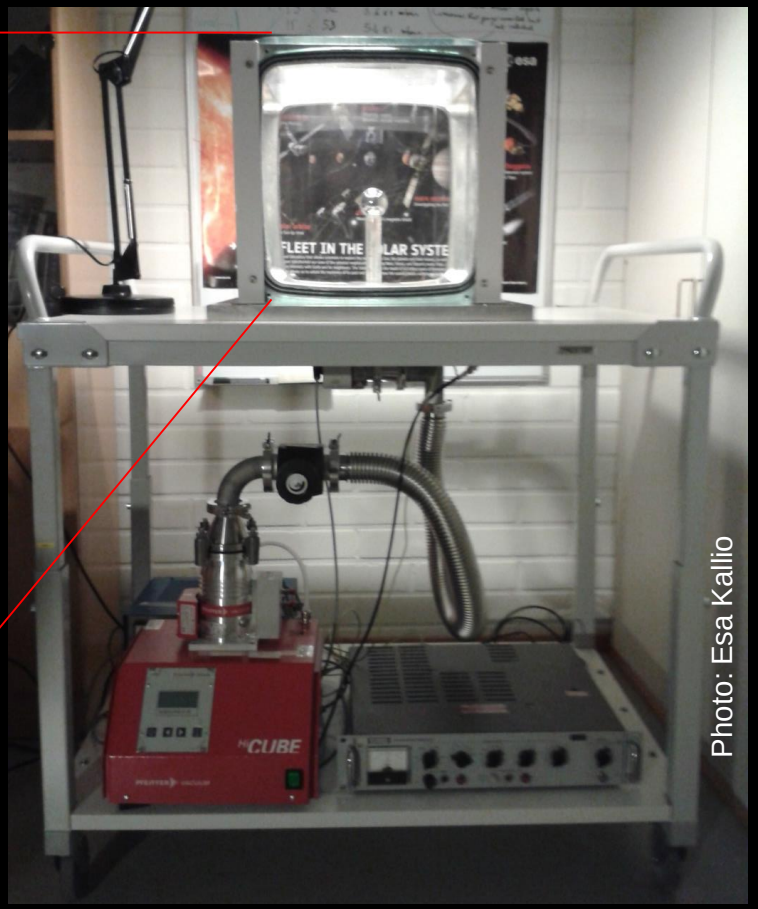
Payload:
- White light camera
- Radio instrument (~ 1-10 MHz)

Joint measurements with ground based equipments

http://www.suomi100satelliitti.fi/S100_esilla_AGUssa

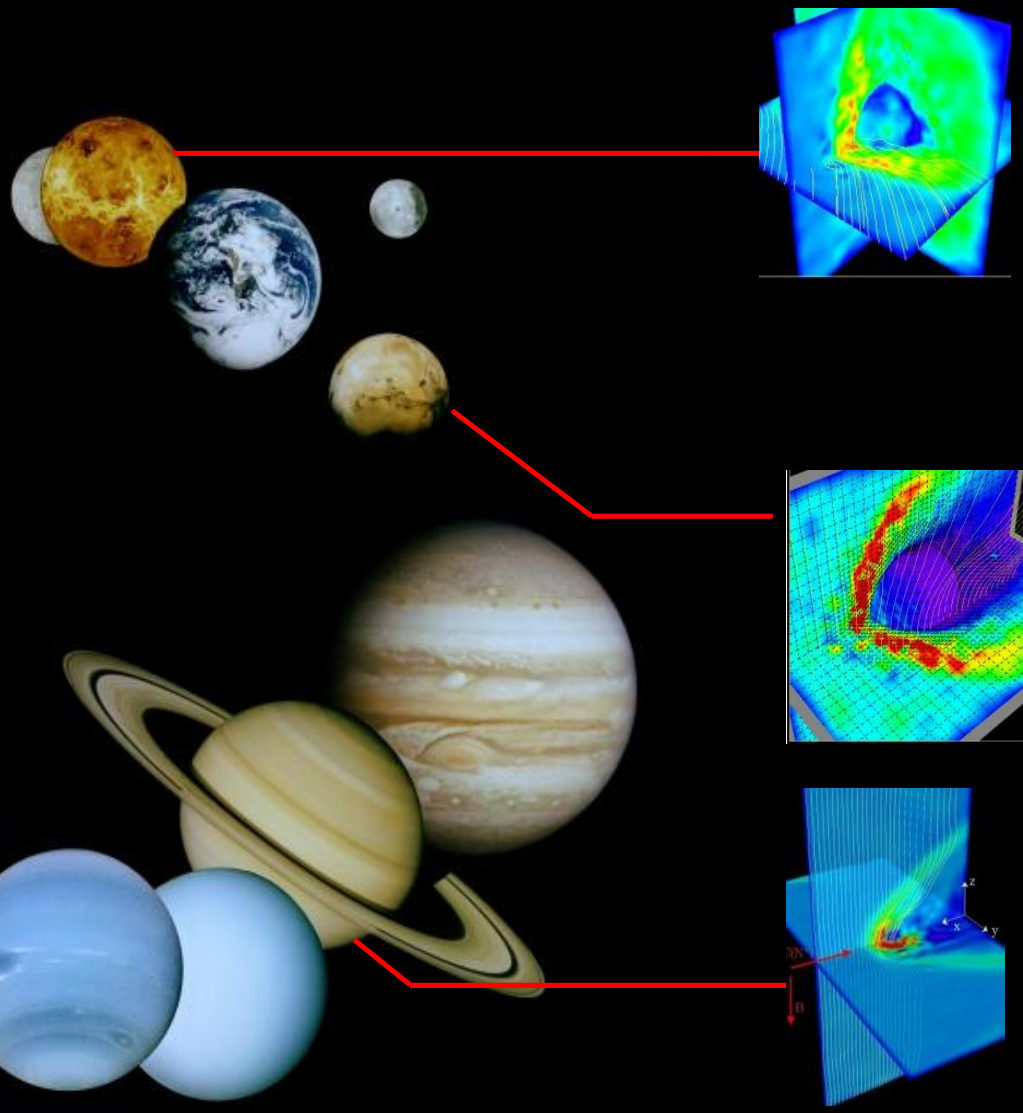
“Electrical space weather simulator”: Aalto University’s “Terrella Cubica”





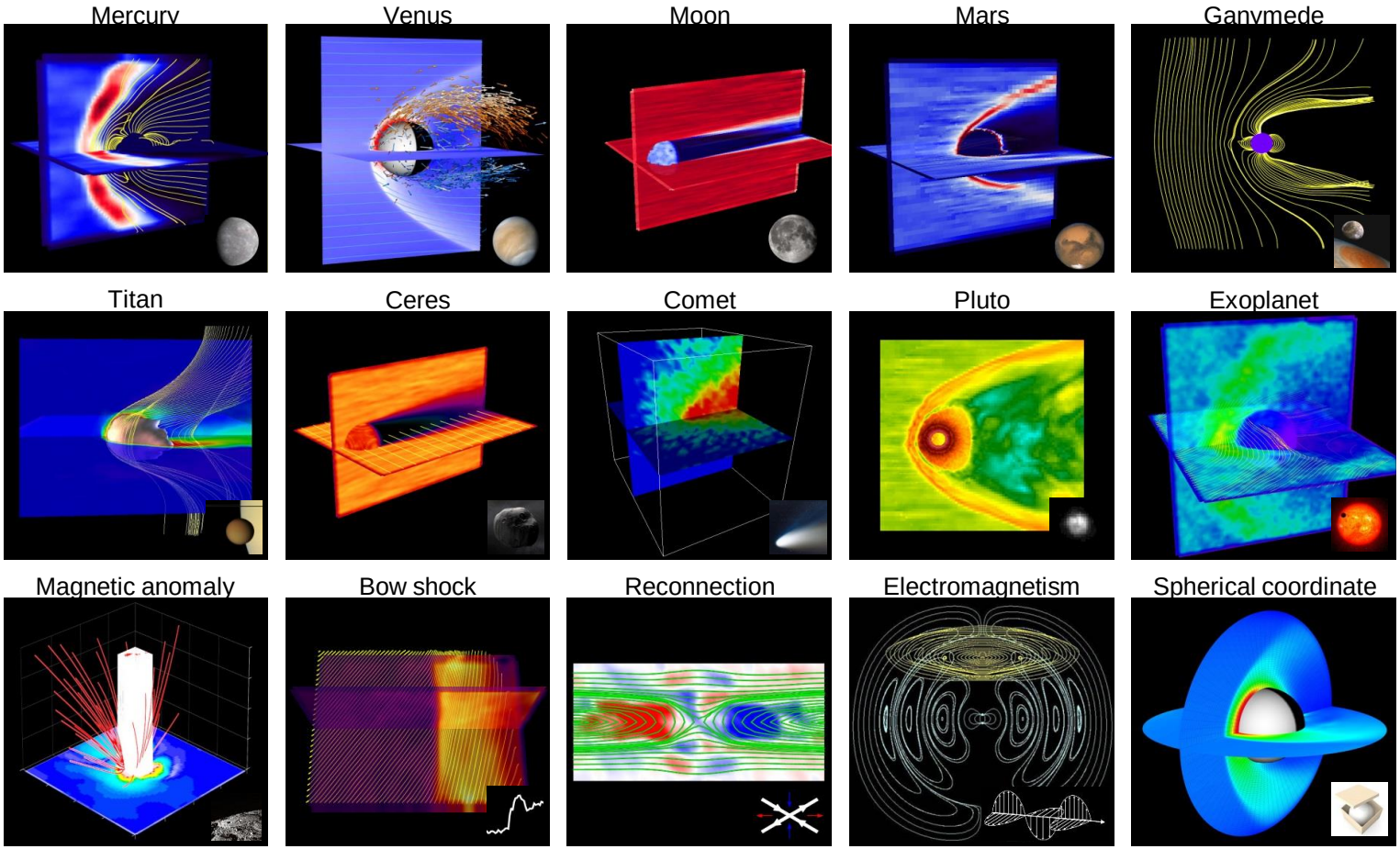
http://space.aalto.fi/education_outreach.html

3. Space plasma modelling & simulations



NASA

Aalto University's space plasma simulations



FMI & Aalto University


WELCOME!