

THE NEO-MAPP PROJECT, FUNDED BY THE EUROPEAN COMMISSION IN SUPPORT OF THE ESA HERA MISSION

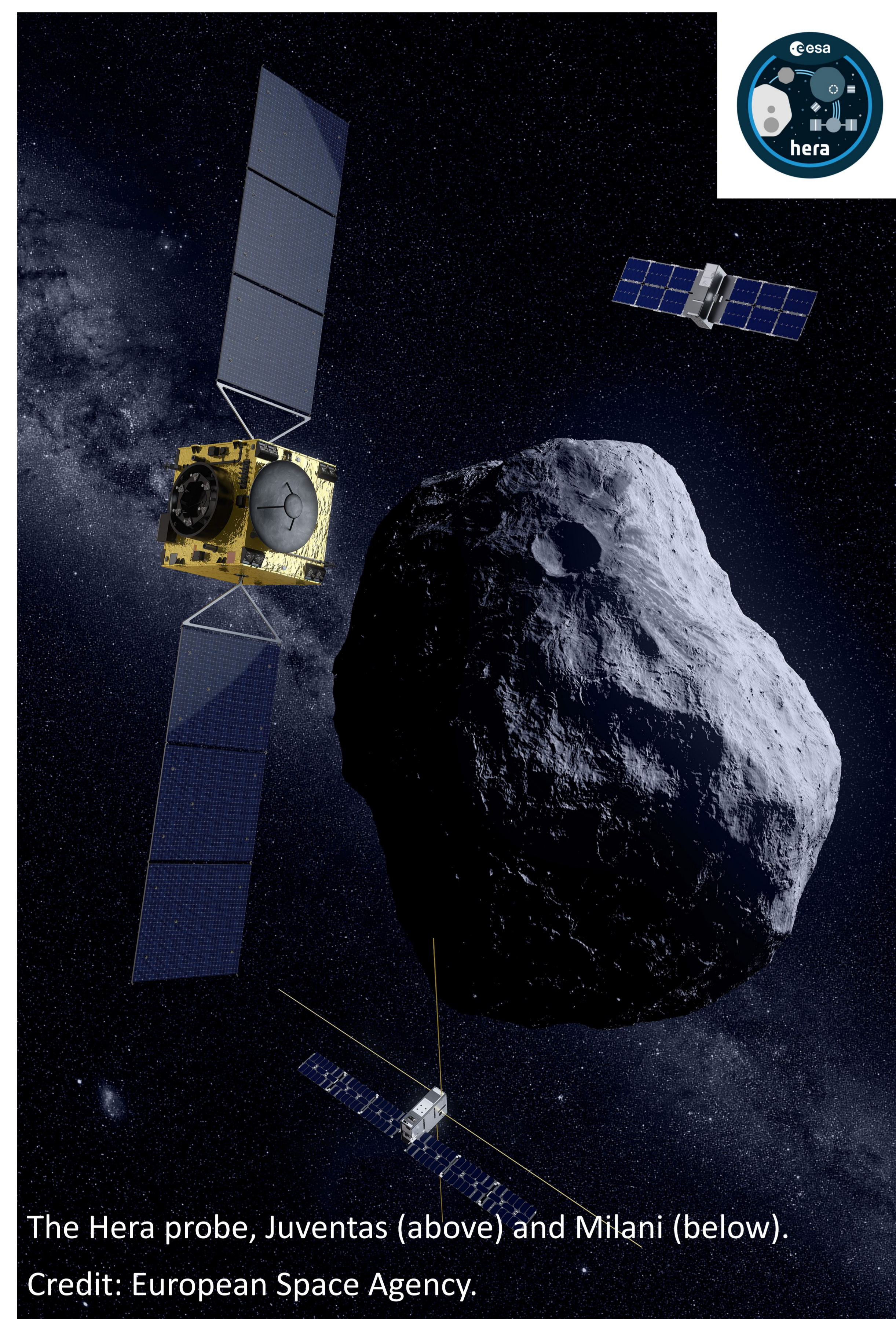
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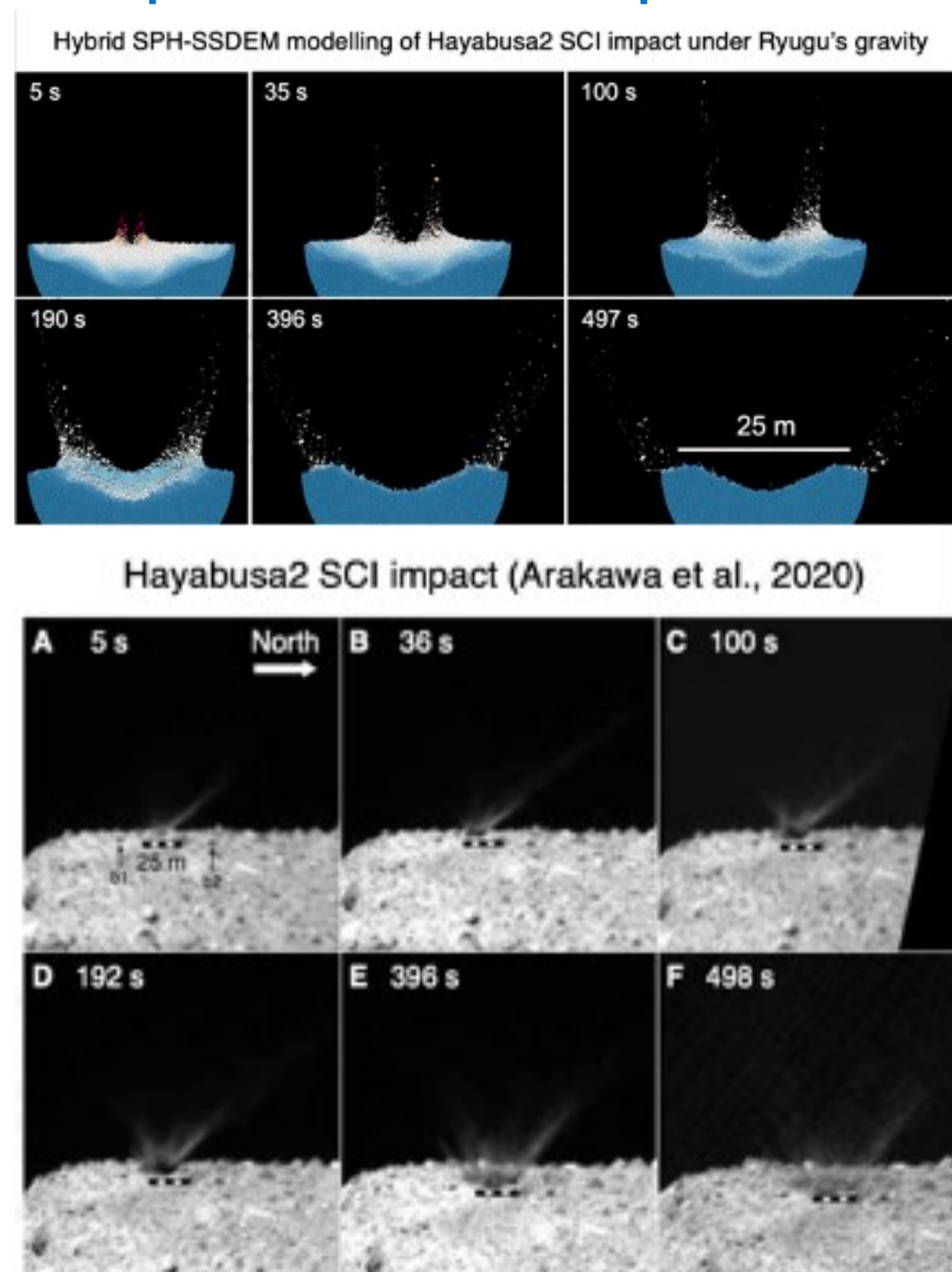
NEO-MAPP main goals: significant advances in both:

- Our understanding of the dynamics and response of NEOs to external forces (in particular a kinetic impact or a close planetary approach), and
- The associated measurements by a spacecraft (including those necessary for the physical and dynamical characterization in general).

NEO-MAPP activities focus on the support of ESA's Hera mission development, and beyond.



Example of advances in impact modelling :

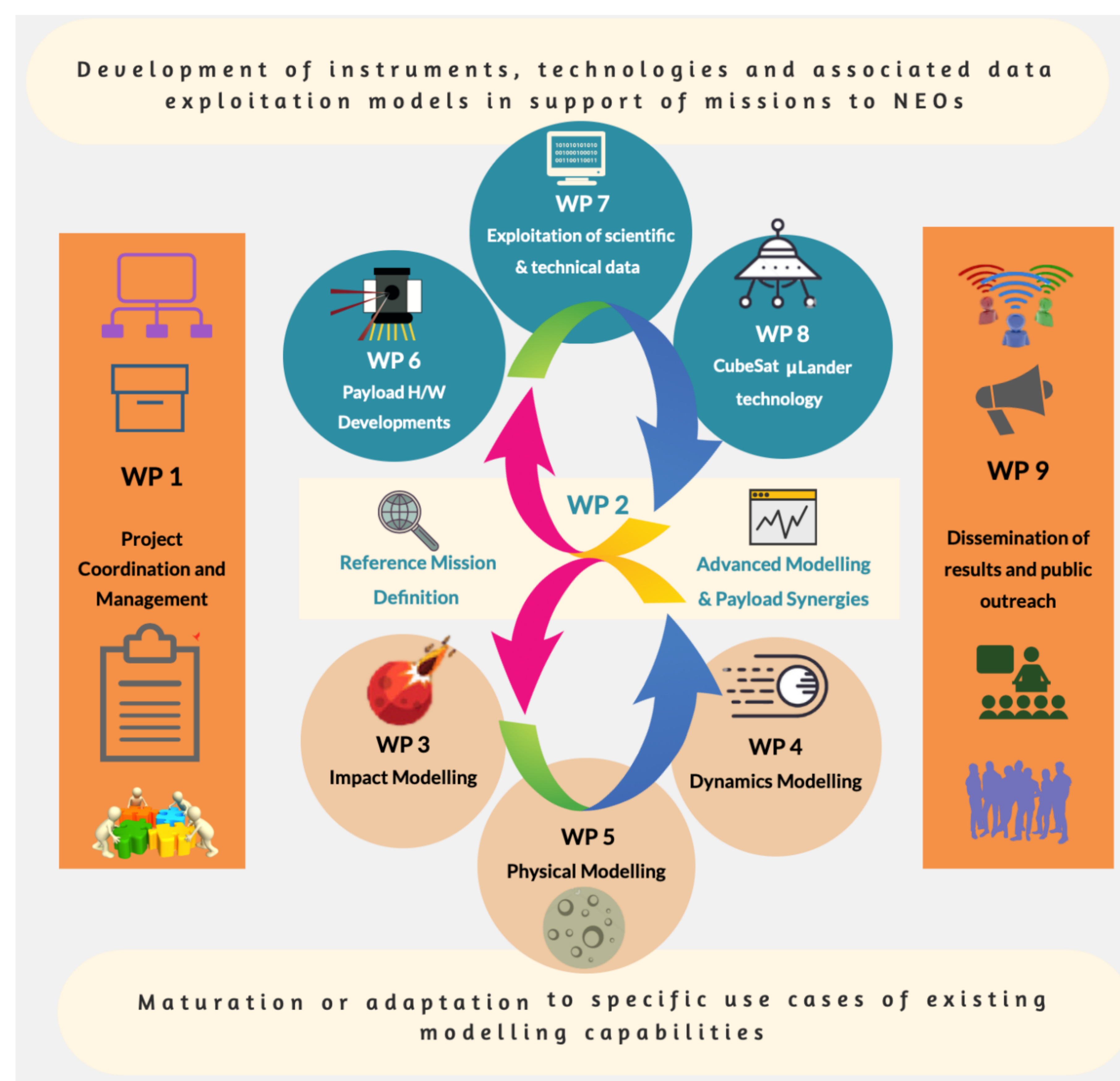


New modelling approach and successful confrontation to the Hayabusa2 Small Carry-on Impactor experiment.



In the framework of the Hera mission, defined as the reference mission:

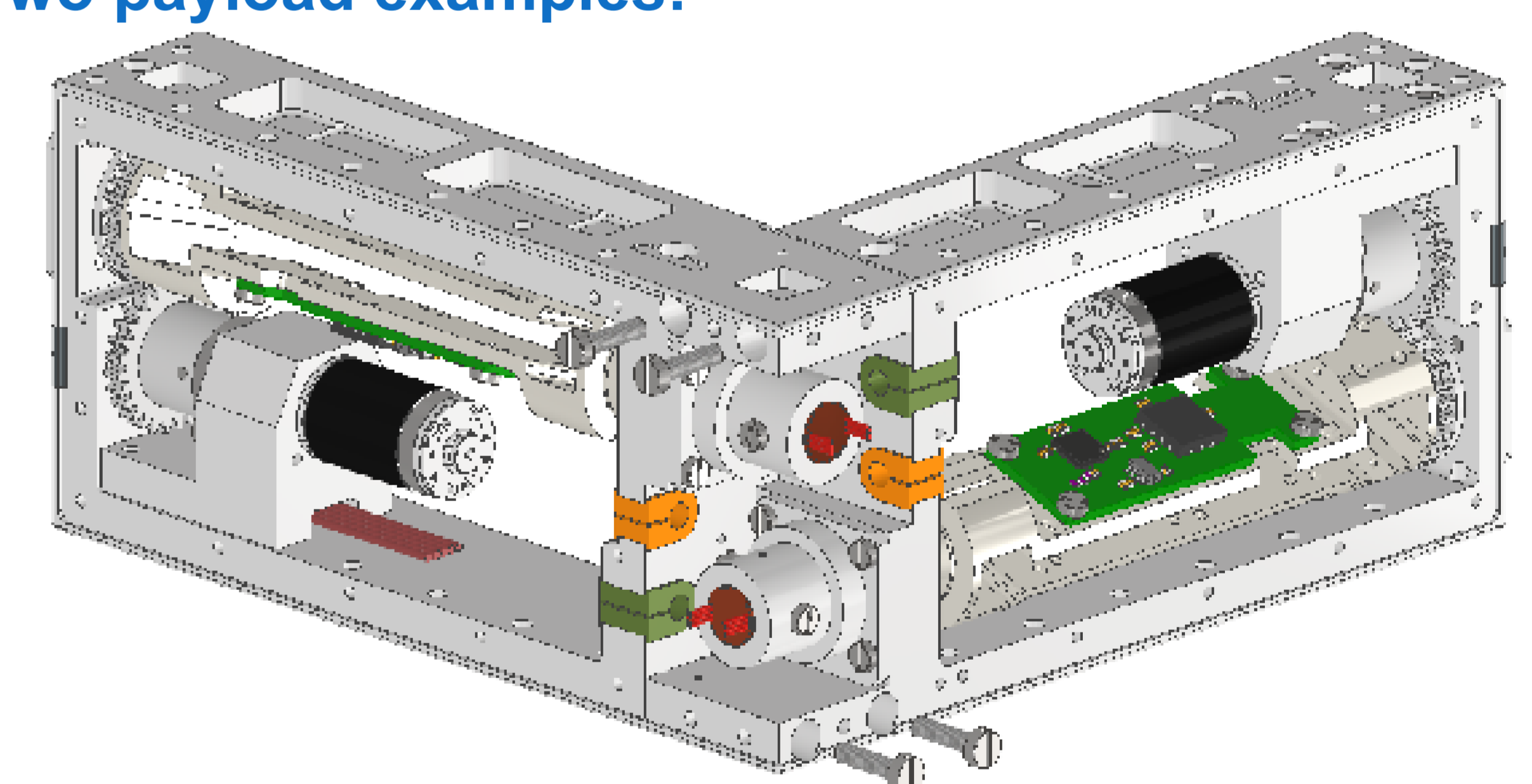
- Pushing the limits of numerical modelling of the response of NEOs to a kinetic impact, as well as of their physical and dynamical properties.
- Increasing the maturity of multiple spaceborn and landed European instruments directly related to planetary defence, focusing on measurements of surface, shallow sub-surface and interior properties of NEOs.
- Developing algorithms and simulators to prepare for close-proximity operations and payload data analyses and exploitation.
- Developing innovative and synergetic measurement and data-analysis strategies that combine multiple payloads, to ensure optimal data exploitation for NEO missions.
- Developing and validating robust GNC strategies and technologies enabling surface interaction and direct response measurements performed by Cubesat or small/micro-lander (μ Lander) architectures.



ESA Description	TRL
Actual system "flight proven" through successful mission operations	9
Actual system completed and accepted for flight ("flight qualified")	8
Model demonstrating the element performance for the operational environment	7
Model demonstrating the critical functions of the element in a relevant environment	6
Component and/or breadboard critical function verification in relevant environment	5
Component and/or breadboard functional verification in laboratory environment	4
Analytical and experimental critical function and/or characteristic proof-of-concept	3
Technology concept and/or application formulated	2
Basic principles observed and reported	1

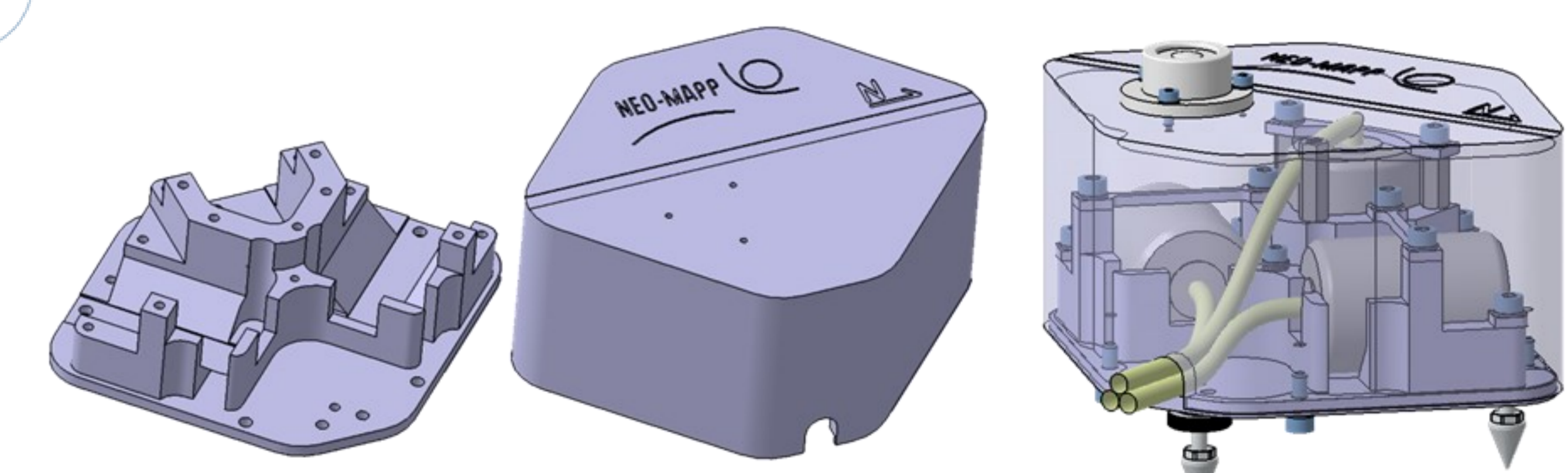
The increased TRL levels the NEO-MAPP study will provide to our five innovative planetary defence payloads.

Two payload examples:



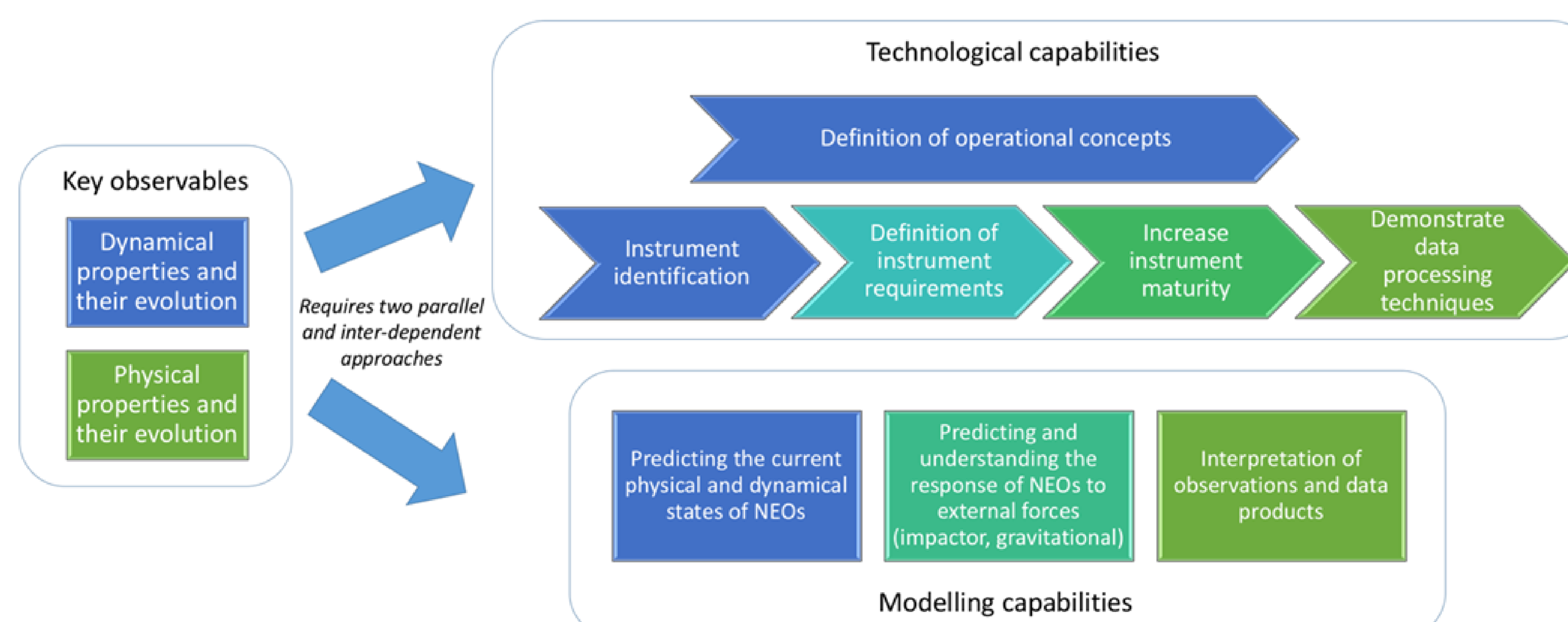
GRASS: GRAVimeter for Small Solar system objects.

Monitoring of the deflection of a flat spring due to a gravitational field by a capacitive transducer. Modulation of the measured g-vector by rotation.



Seismometer: Geophone mechanical assembly design.

The seismic sensors are commercial sensors with no active electronics (specifically designed for borehole extreme environments). We are developing our own the acquisition electronics. Not part of the Hera mission.



NEO-MAPP study concept:

In order to obtain and correctly interpret the key observables critical for a successful planetary defence mission, two parallel and inter-dependent approaches are necessary. NEO-MAPP will develop both the modelling and technological required capabilities, which correspond to the first two sub-topics of the call.



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