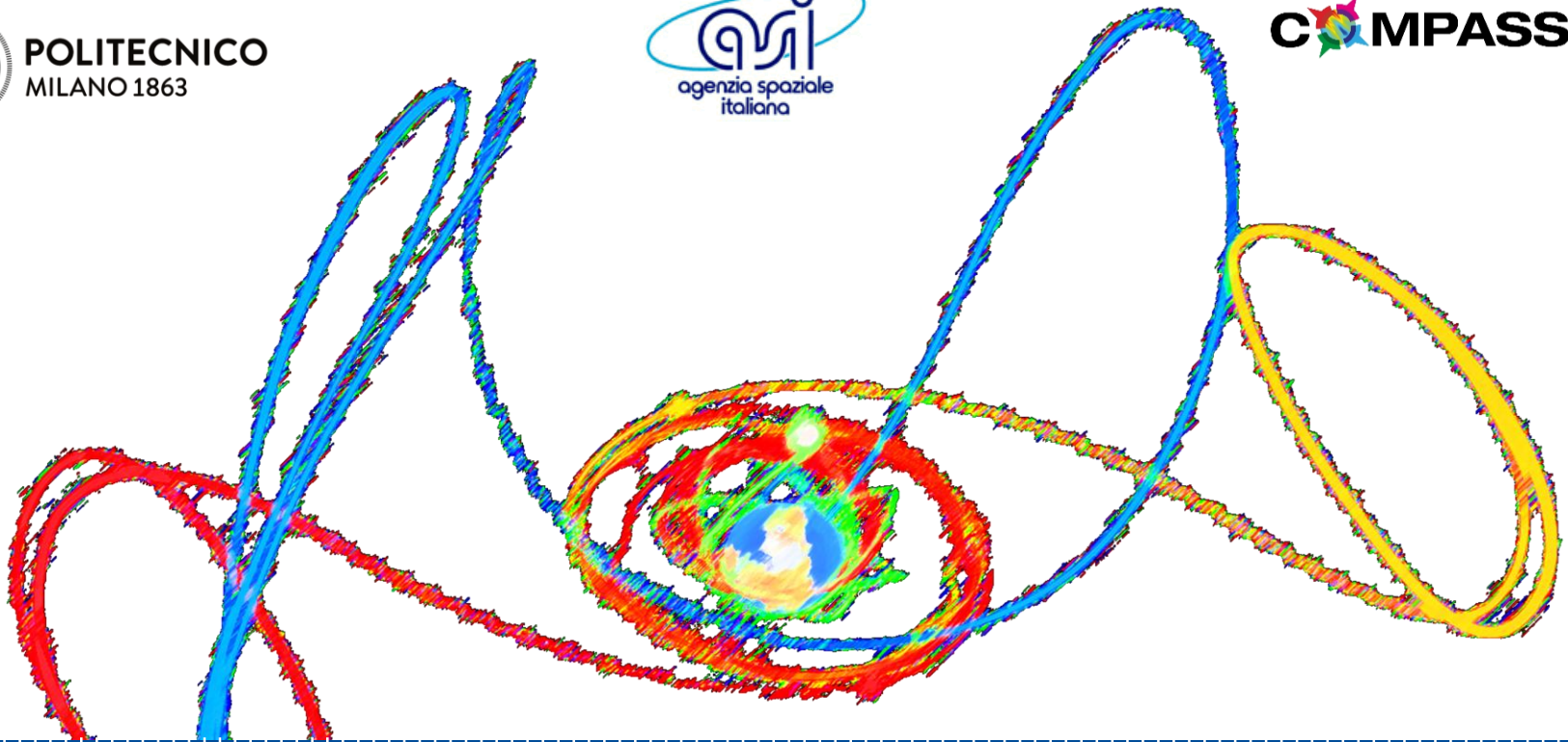




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Mission analysis for potential threat scenarios: kinetic impactor

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Introduction

Space Mission Planning Advisory Group (SMPAG)

Prepare a coordinated response protocol to an impact threat scenario

- Criteria and thresholds for impact response actions
- Mitigation mission types/technologies to be considered
- Mapping of threat scenarios to mission types
- Reference missions for different NEO threat scenarios
- A plan for action in case of a credible threat
- Communication guidelines in case of a credible threat
- Roadmap for future work on planetary defence
- Criteria for deflection targeting
- Toolbox for a characterisation payload



Reference missions for different threat scenarios

- Define a number of typical Near Earth Objects (NEOs) threat cases (based on time to closest approach, material characteristics, dynamical properties)
- Set of reference mission identified (e.g. mass; orbit; time-to-closest-approach) and evaluated in accordance with criteria defined (e.g. time between the impact alert and the launch window opening, etc).
- Sensitivity analysis on accuracy of orbit determination
- Robust control on the magnitude and direction of the imparted delta-velocity, centre of impact point
- For each reference mission investigate political and financial implications and constraints in the risk mitigation analysis
- Considering several deflection strategies

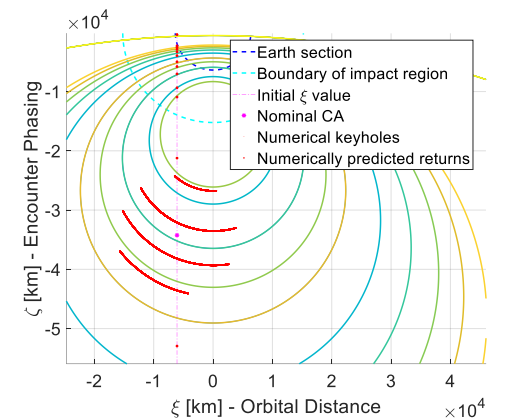
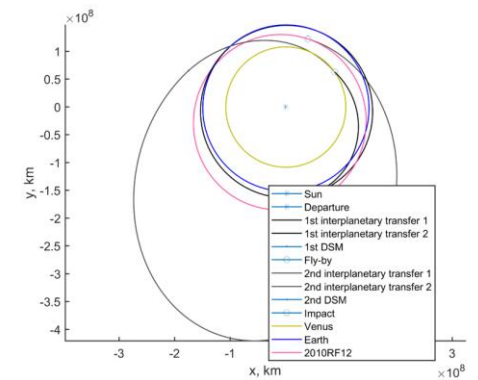
Summary till January 2018

- Target asteroid selection
- Definition of threat scenarios: direct hit and resonant scenario
- Mission design for kinetic impactor direct hit
 - Mission analysis
 - System design
 - Additional payload to be agreed with Payload Toolbox task
- Gravity tug system design

Insight into kinetic impactor design

Goals

- Improve trajectory design of the direct impact to improve deflection efficiency
 - Consider fly-bys during trajectory
- Study resonant encounter hit
 - Design of deflection manoeuvre robust to multiple encounters
 - Avoiding deflecting into a resonant return
- Guidance navigation and control of the approach phase
 - Navigation based on visual camera
 - Feedback on-board control algorithm



- By SMPAG meeting Feb 2019: write report including
 - Mission design work (IAC paper 2017)
 - Insight into kinetic impactor design
 - Improve trajectory design of the direct impact to improve deflection efficiency
 - Study resonant encounter hit
 - Guidance navigation and control of the approach phase
 - Gravity tug?



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