Geophysical Research Abstracts
Vol. 18, EGU2016-16103, 2016
EGU General Assembly 2016

SeisCube Instrument and Environment Considerations for the Didymos System Geophysical Exploration

Alexandre Cadu (1), Naomi Murdoch (1), David Mimoun (1), Ozgur Karatekin (2), Raphaël F Garica (1), Jose A Carrasco (3), Francisco G De Quiros (3), Hugues Vasseur (4), Marshall Eubanks (5), Charles Radley (5), Birgit Ritter (2), and Veronique Dehant (2)

(1) ISAE-Supaero, Toulouse, France, (2) Royal Observatory of Belgium, Brussels, Belgium, (3) EMXYS, Elche, Spain, (4) Antwerp Space, Antwerp, Belgium, (5) Asteroid Initiatives, Clifton, VA, USA

In the context of the Asteroid Impact & Deviation Assessment (AIDA) mission proposed by ESA and NASA, the Asteroid Geophysical Explorer (AGEX) mission concept has been selected for a preliminary study phase. Two 3-Unit CubeSats are embedded into the AIM probe and released into the asteroid binary system [1]. SeisCube will be deployed close to the secondary to reach its surface at a low relative velocity in order to stay on the ground after several rebounds, in a similar way that is foreseen for Mascot-2.

The purpose of SeisCube is to provide information about the surface, the sub-surface and the internal structure of the asteroid, by analyzing rebound acceleration profile and seismic activity [2]. We describe the considered instrumentation necessary to fulfill the science objectives (gravimeters, accelerometers, geophones, etc.) in terms of measurement dynamics, frequency ranges, acquisition methods and other common budgets for space equipment.

We also present the environment considerations which have to be taken into account for the platform and payload designs. The thermal aspect will be particularly discussed since it is a major issue in the airless body exploration [3] [4]. It implies some modifications in the CubeSat structure, integration and thermal regulation to ensure survival and operations under extreme conditions at the asteroid surface.

We then describe the platform subsystems needed to ensure the operations after the deployment and the associated budgets and accommodation. As a direct consequence of the previous topics, we will finally discuss the possible trades-off to satisfy the main science requirements and the associated concept of operations.

[1] O. Karatekin, D. Mimoun, J. A. Carrasco, N. Murdoch, A. Cadu, R. F. Garcia, F. G. De Quiros, H. Vasseur, B. Ritter, M. Eubanks, C. Radley and V. Dehant, "The Asteroid Geophysical Explorer (AGEX): Proposal to explore Didymos system using Cubsats," in European Geophysical Union, 2016.

[2] N. Murdoch, A. Cadu, D. Mimoun, O. Karatekin, R. F. Garcia, J. A. Carrasco, F. G. De Guiros, H. Vasseur, B. Ritter, M. Eubanks, C. Radley and V. Dehart, "Invertigating the surface and subsurface properties of the Didymos binary asteroid with a landed CubeSat," in European Geophysical Union, 2016.

[3] J. De Lafontaine and D. Kassing, "Technologies and Concepts for Lunar Surface Exploration," Acta Astronautica, vol. 38, no. 2, pp. 125-129, 1996.

[4] S. Ulamec, J. Biele and E. Trollope, "How to survive a Lunar night," Planetary and Space Science, vol. 58, no. 14-15, pp. 1985-1995, 2010.