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The ODINUS Mission Concept: a Mission to the Ice Giant Planets

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We present the scientific case and the mission concept for the comparative exploration of the ice giant planets Uranus and Neptune and their satellites with a pair of twin spacecraft: ODINUS (Origins, Dynamics and Interiors of Neptunian and Uranian Systems). The ODINUS proposal was submitted in response to the call for white papers for the definition of the themes of the L2 and L3 mission in the framework of the ESA Cosmic Vision 2015-2025 program. The goal of ODINUS is the advancement of our understanding of the ancient past of the Solar System and, more generally, of how planetary systems form and evolve. The mission concept is focused on providing elements to answer to the scientific themes of the Cosmic Vision 2015-2025 program: What are the conditions for planetary formation and the emergency of life? How does the Solar System work? What are the fundamental physical laws of the Universe? In order to achieve its goals, the ODINUS mission concept proposed the use of two twin spacecraft to be put in orbit around Uranus and Neptune respectively, with selected flybys of their satellites. The proposed measurements aim to study the atmospheres and magnetospheres of the planets, the surfaces of the satellites, and the interior structure and composition of both satellites and planets. An important possibility for performing fundamental physics studies (among them tests of general relativity theory) is offered by the cruise phase. After the extremely positive evaluation of ESA Senior Survey Committee, who stated that "the exploration of the icy giants appears to be a timely milestone, fully appropriate for an L class mission", we discuss strategies to comparatively study Uranus and Neptune with future international missions.