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Daedalus: a Candidate ESA Earth Explorer Mission for the Exploration of the Lower Thermosphere-Ionosphere

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The Daedalus mission has been proposed to the European Space Agency (ESA) in response to the call for ideas for the Earth Observation programme's Earth Explorers. It was selected in 2018 as one of three candidates for Earth Explorer 10, and is currently undergoing a Phase-0 Science and Requirements Consolidation Study. The goal of the mission is to quantify the key electrodynamic processes that determine the structure and composition of the Lower Thermosphere-Ionosphere (LTI), focusing in particular on processes related to ion-neutral coupling. Daedalus will perform in-situ measurements of plasma density and temperature, ion drift, neutral density and wind, ion and neutral composition, electric and magnetic fields and precipitating particles. An innovative preliminary mission design allows Daedalus to perform these measurements down to altitudes of 140 km and below. These measurements will quantify the amount of energy locally deposited in the upper atmosphere via Joule heating and energetic particle precipitation, estimates of which currently vary by orders of magnitude between models. At the same time, the instrumentation of Daedalus will enable exploration of the variability and dynamics of the LTI, as well as science questions related to connections between the LTI and the atmosphere below. Daedalus will thus study the most under-explored region of the Earth's environment, the "agnostosphere", which is the gateway between Earth's atmosphere and space. In this presentation an overview of the Daedalus Mission Concept will be given, including the status of the ongoing Phase-0 Study.

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