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PICASSO: a PICo-satellite for Atmospheric and Space Science Observations

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The recent surge in the development of small satellite platforms could offer the opportunity to significantly decrease the overall cost of science missions, if suitable instruments can be operated from such platforms. PICASSO is a CubeSat demonstration mission initiated by the Belgian Institute for Space Aeronomy and implemented by the European Space Agency (ESA). Its objective is to assess the ability of very low-cost satellites to carry out atmospheric measurements. PICASSO focuses on retrieving the ozone distribution in the stratosphere, the temperature profile up to the mesosphere, and the electronic density and temperature in the ionosphere.

Following its launch on a VEGA rocket in March 2020, PICASSO will fly for two years. The overall demonstration mission includes the end-to-end development of the satellite, launch, operation, and analysis of the scientific data. PICASSO follows a polar orbit at an altitude ranging from 475 to 500 km and an inclination of 98°. Its payload consists of a miniaturised hyper-spectral imager (VISION) and a four needle-like Sweeping Langmuir Probe (SLP). It utilizes four deployable solar panels with an average power generation of 8.7W, two on-board computers (OBC and PLC), and a high-performance ADCS with a pointing accuracy of around 1°.

The scientific objectives of VISION are to demonstrate the retrieval of polar and mid-latitude stratospheric ozone vertical profiles from multispectral transmittances observed in solar occultations. For SLP, the main goals are to study the ionosphere-plasmasphere coupling and aurora structures, and to monitor the density irregularities in the polar cap ionosphere.