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The Changing-Atmosphere Infra-Red Tomography Explorer CAIRT –a candidate mission for ESA's Earth Explorer 11

The Changing-Atmosphere Infra-Red Tomography Explorer (CAIRT) is one of the two remaining candidate missions competing for implementation as ESA's Earth Explorer 11. CAIRT aims to reveal, resolve, and unravel the complex coupling between composition, circulation, and climate in our middle atmosphere, by improving our knowledge of the chemical-dynamic-radiative interactions that govern our climate system. CAIRT, a Fourier Transform Spectrometer for infrared limb hyperspectral imaging, would provide continuous limb radiance measurements from the mid-troposphere to the lower thermosphere, at high spectral resolution and with unprecedented horizontal and vertical sampling. Leveraging an innovative tomographic retrieval approach, CAIRT would produce a unique three-dimensional dataset of numerous trace gases, temperature and aerosols across the entire middle atmosphere to the edge of space. With this, CAIRT would provide critical information on: (a) atmospheric gravity waves, circulation and mixing; (b) coupling with the upper atmosphere, solar variability and space weather and; (c) aerosols and pollutants in the upper troposphere and lower stratosphere.

CAIRT would thoroughly explore and elucidate the role of the middle atmosphere in climate dynamics, forcing and feedbacks. It would firmly anchor this knowledge in a more holistic understanding of fundamental processes within the Earth system, whilst equally supporting applications providing direct societal benefits and informing international policy-making and policy implementation.

CAIRT is currently undergoing Phase A feasibility studies. A broad overview of the mission and its science objectives will be given, as well as some more detailed insight into performance expectations from previous studies and on-going activities.

Topic

Upcoming Earth observation limb and occultation instruments

Authors: HOFFMANN, Alex (European Space Research and Technology Centre, European Space Agency (ESA/ESTEC), Noordwijk, The Netherlands); MALAVART, Alizee (European Space Research and Technology Centre, European Space Agency (ESA/ESTEC), Noordwijk, The Netherlands); FUNKE, Bernd (Instituto de Astrofísica de Andalucía, CSIC, Granada, Spain); SINNHUBER, Björn-Martin (Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany); SCHÜTTEMEYER, Dirk (European Space Research and Technology Centre, European Space Agency (ESA/ESTEC), Noordwijk, The Netherlands); HOLM, Elias (ECMWF, Reading, UK); FRIEDL-VALLON, Felix (arlsruhe Institute of Technology (KIT), Karlsruhe, Germany); UNGERMANN, Jörn (Forschungszentrum Jülich, Germany); WALKER, Kaley A. (Department of Physics, University of Toronto, Canada); CHIPPERFIELD, Martyn (University of Leeds, UK); HÖPFNER, Michael (Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany); VERRONEN, Pekka (University of Oulu, Sodankylä, and Finnish Meteorological Institute, Helsinki, Finland); PREUSSE, Peter (Forschungszentrum Jülich, Germany); RASPOLLINI, Piera (IFAC-CNR, National Research Council, Sesto Fiorentino, Italy); ERRERA, Quentin (Royal Belgian Institute for Space Aeronomy (BIRA- IASB), Brussels, Belgium); OSPREY, Scott (University of Oxford, UK); GODIN-BEEKMANN, Sophie (Centre National de la Recherche Scientifique, Sorbonne Université, Paris, France)

Presenter: FUNKE, Bernd (Instituto de Astrofísica de Andalucía, CSIC, Granada, Spain)