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# A miniature particle counter LOAC under meteorological balloon for the survey of stratospheric aerosols – comparison with other datasets

Damien Vignelles (1), Bwenael Berthet (1), Jean-Baptiste Renard (1), Landon Rieger (2), Adam Bourassa (2), Jean-Paul Vernier (3,4), Ghassan Taha (5,6), Sergey Khaykin (7), Thibaut Lurton (1), Fabrice Jegou (1), Benoît Couté (1), and Vincent Duverger (1)

(1) CNRS LPC2E/UMR7328, Laboratoire de physique et de chimie de l'environnement et de l'espace, Orléans, France (damien.vignelles@cnrs-orleans.fr), (2) Institute of Space and Atmospheric Studies, University of Saskatchewan, Saskatoon, Canada, (3) Science Systems and Applications Inc., Hampton, USA, (4) NASA Langley Research Center, USA, (5) Universities Space Research Association, Greenbelt, MD, USA, (6) NASA Goddard Space Flight Center, Greenbelt, MD, USA, (7) LATMOS, CNRS, University of Versailles St Quentin, Guyancourt, France

Stratospheric aerosols contribute to the terrestrial radiative budget during large eruptive events but also during volcanic quiescent periods (Kremser et al. 2016). The survey of background stratospheric aerosols, especially in the middle stratosphere, is challenging due to extreme experimental conditions and low particle concentration. Furthermore, during periods of low volcanic activity, origins and optical properties of aerosols in the middle and high stratosphere are not well defined yet (Neely et al. 2011). We propose to study the capabilities of a new miniature particle counter called LOAC (Light Optical Aerosol Counter), light enough to be carried under meteorological balloons, whichensure a very good frequency of flights and designed to be able to measure and discriminate between several main aerosol types.

The LOAC miniature particle counter has been initially designed for balloon-borne tropospheric studies (Renard et al. 2016).Metrological performances of the LOAC instrument have been determined in the laboratory and during balloon flights. Principal limitations of the use of LOAC in the stratosphere areinduced by the temperature variations and the influence of cosmic rays. A detection threshold has been determined in the laboratory to be of 0.8 particule.cm-3 in terms of concentration which also limits the use of LOAC in the stratosphere where aerosol concentrations during volcanic quiescent periods may be lower than this limit.

Since June 2013, more than 100 hundred LOAC instruments have been launched under meteorological balloons during the ChArMEx and Voltaire-LOAC field campaigns. This dataset has been studied and compared to satellite records such as OSIRIS, OMPS, and CALIOPbut also to ground-based lidar data (NDACC lidar OHP) and outputs from the WACCM/CARMA model. Results show that large variations in stratospheric aerosols are well defined by satellite but less visible in LOAC records. Instrumental LOAC limitations in the stratosphere can explain some of the difference between remote sensing methods and in-situ measurements but suggest also that local variations in the stratospheric aerosol contents may exist during volcanic quiescent periods. Flights made through the Calbucoplume in stratosphere during the summer 2015 show that LOAC can describe distribution in size and particle concentrations in a perturbed lower stratosphere. In the stratosphere free of volcanic influence, an integration time of 10 minutes shows better results.

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