Objectives

The ongoing EECLAT project unites and organizes the present and future work of the French scientific community that studies atmospheric composition (clouds, aerosols, chemistry) mainly through the spaceborne observations of the A-Train satellite constellation and Earth-Care.

Main results

The EECLAT project contains more than 30 work packages. LEFE funding has helped a large number of contributors to meet and discuss their projects and results. This has greatly helped to structure and mutualize their efforts, and created a sense of scientific community grouped around common research topics and methods.

Research-wise, the EECLAT project has helped several projects to address open scientific questions related to the global distribution of clouds, the relevance of various local atmospheric processes on their formation and dissipation, nucleation processes inside stratospheric clouds, the speciation and quantification of aerosol species, the evaluation of climate and chemistry transport models and more. Answering these questions requires the development of retrieval techniques (e.g. particle microphysical properties from combined radar-lidar observations leading to the DARDAR product), the production of large research datasets (e.g. global cloud distributions at climate-relevant scales in the GOCCP product), and making new measurements, either by developing new ground-based instrumentation (LaMP/OPGC lidar, IPRAL lidar) or in-situ during airborne campaigns (YAK-AEROSIB French-Russian campaign, LNG-CALIPSO campaign). EECLAT also includes development work being done on the nominal IIR products of the CALIPSO mission, led by the French CALIPSO Co-PI Jacques Pelon.

The integrating nature of the project help individual research groups place their results in a broader context still relevant to their methodological and scientific interests, confront results using separate approaches, and combine different expertises to address a single scientific question. For instance, EECLAT includes studies of aerosols and trace gases concentrations based on the analysis of airborne in-situ measurements during field campaigns (YAK-AEROSIB, CHARMEX), chemistry transport models (CHIMERE), and of course satellite observations which are the common thread in the context of EECLAT.

Given the coordinating nature of the project, the bulk of the LEFE funding has focused specifically on encouraging scientific animation and communication between participants. Thanks to this funding, two workshops were organized in January 2013 (Besse, France) and 2014 (La Rochelle, France). During these, more than 30 participants to the project were able to meet, exchange ideas and results, and investigate new research avenues. Several projects were initiated thanks to these exchanges. The community is appreciative of this opportunity for making independent projects more visible, coordinating research efforts in a unified framework and encouraging collaboration. The scientific programmes of these workshops, slides of the scientific and coordinating presentations, and meeting minutes are visible online at http://eeclat.ipsl.jussieu.fr/workshops/.
Fig. 1 (left): Arctic low level cloud cover (a) observed by CALIPSO-GOCCP (b-f) simulated by five climate models+COSP simulator. From Cesana and Chepfer, GRL, 2012.

Fig. 2 (right): Overpass A-Train / RALI during LNG-CALIPSO campaign (flight 35). a) CALIPSO 532nm signal, b) CloudSat reflectivity, c) DARDAR mask, d) LNG 532nm signal, e) RASTA reflectivity, f) RALI (A-Train-like) mask, g) LNG 355nm Mie channel, h) LNG 355nm Rayleigh channel, i) RALI (EarthCare-like) mask. These results show an example of A-Train instrumental synergy, as they combine the strong points of the CALIPSO lidar and the CloudSat radar to reach the most exhaustive possible cloud detection.

Future of the project: The EECLAT project answers annually to the TOSCA-Atmosphere and LEFE-IMAGO calls to research propositions that have funded its efforts since 2010. Participants to the project have expressed their desire to renew this proposition for the next years.

Nombre de publications, de communications et de thèses
75 articles related to the project were published in peer-reviewed journals in the period 2010-2014. An up-to-date list of publications can be found at http://eeclat.ipsl.jussieu.fr/publications/. Below are five publications from 2013 and 2014 that are somewhat representative of the people and scientific issues involved in EECLAT.