Report on the outcomes of a Virtual Mobility[1]

Action number: CA24135

Grantee name: Juan Antonio BRAVO ARANDA

Virtual Mobility Details

Title: community-reviewed ACI algorithm/method inventory

Start date: 21/09/2026

End date: 10/10/2026

Description of the work carried out during the VM

The work focused on developing an inventory of observational methods for aerosol–cloud interactions (ACI), using the existing EARLICOST WG2c community survey as the starting point. My contribution comprised screening the survey information, defining comparable method descriptions and reviewing the associated literature. Relative to the initial plan, the work placed greater emphasis on literature-based method identification and physical classification. The resulting document provides a substantive basis for community review.

The literature-based inventory, with 73 references, was organized into 23 method families: 10 surface-based and 13 satellite-based approaches. Remote sensing remained an essential inclusion criterion, with in situ observations, meteorological information and models treated as complementary inputs where appropriate. Each method was described through its principal references, observational requirements and analysis outputs.

A 3 × 3 classification was developed to group method families according to the aerosol information and cloud properties used to investigate ACI. Aerosol categories distinguish microphysical or activation properties, optical properties and source- or transport-based indicators; cloud categories distinguish microphysics, optical properties, and state or evolution.

Input–output tables and an applicability assessment were prepared, including assumptions, strengths and requirements for interpreting aerosol–cloud relationships. Based on all the gathered information, an applicability discussion is included to support the scientific synthesis for deliverable D2.1.

Virtual collaboration was carried out with Michael Sicard, ERA Chair holder at the Laboratoire de l'Atmosphère et des Cyclones (LACy), University of La Réunion, France, within the REALISTIC project (Grant Agreement 101086690). Weekly two-hour online meetings focused

[1] This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the Grant Holder Manager to verify the grant documents compliance and proceed with the payment.

on discussing newly identified publications, defining method groups, identifying their main characteristics and critically assessing the findings. These exchanges also guided the structure of the inventory as a contribution to D2.1. The collaboration combined Michael Sicard's expertise in lidar remote sensing with my experience in both lidar and cloud radar, supporting joint assessment of multi-instrument approaches. Additional online discussions were held with Adrián Canella-Ortiz, Carmen Córdoba-Jabonero and Eleni Marinou to clarify specific aspects of the techniques and their classification within the inventory, building on previous scientific exchanges.

Description of the VM main achievements and planned follow-up activities

The principal output is a referenced draft contribution to D2.1, "Report on existing algorithms, the most useful synergies, existing datasets from networks and field campaigns, and new synergy approaches". It contains 23 method families supported by 73 references, with comparable descriptions of observational requirements, outputs and assumptions. Table 1 summarises the main activities, their outputs and their contribution to D2.1.

The inventory preparation and structuring objectives have been substantially addressed. The classification distinguishes measured, retrieved and parameterised quantities and highlights microphysics–microphysics approaches relevant to activation and ice production. Optical-proxy and source-based approaches address complementary cloud responses; classification does not imply a quality ranking. Figure 1 shows the number of method families assigned to each aerosol–cloud class, distinguishing surface-based and satellite-based approaches. A given method family may contribute to more than one class.

The VM contributed to EARLICOST Research Coordination Objective O3, "Increase the exploitation of lidar products in microphysical retrievals and multi-sensor synergies", by documenting ACI methods, including lidar–radar approaches, in a comparable format. It also supports Capacity-building Objective O3, "Increase the applicability of lidar products in terms of microphysical retrievals and synergies", through a common methodological resource for developers and users. The work addresses the inventory component of WG2 Task T2.3 and provides input to D2.1.

The VM contributed to the interdisciplinary dimension of the COST pillar "Fostering Interdisciplinary & Cross-Sector Collaboration" through scientific exchanges bringing together complementary expertise in lidar, cloud radar and aerosol–cloud interactions. Weekly online meetings with Michael Sicard supported the critical assessment of published methods and the development of the inventory structure. Additional discussions with Adrián Canella-Ortiz, Carmen Córdoba-Jabonero and Eleni Marinou helped clarify technical aspects and method classification. These exchanges supported a common understanding of observational requirements and methodological assumptions for the contribution to D2.1.

Proposed follow-up comprises completing the D2.1 contribution, circulating it within WG2c and seeking contributor confirmation of software availability, maturity and validation. Subsequent implementation and benchmarking would require agreed cases, sampling criteria and uncertainty treatment.

Table 1: Summary of the main activities, outputs and contributions to EARLICOST deliverable D2.1.

Activity	Main output	Contribution to D2.1
Survey screening and literature review	Inventory of 23 method families: 10 surface-based and 13 satellite-based	Defines the methodological scope
Method classification	3 × 3 aerosol–cloud classification matrix	Organises methods by aerosol information and cloud properties
Harmonised method documentation	Input–output tables and applicability assessment under revision	Supports comparison and subsequent method selection
Identification of documentation gaps	Items requiring contributor confirmation	Provides a basis for community review and future updates

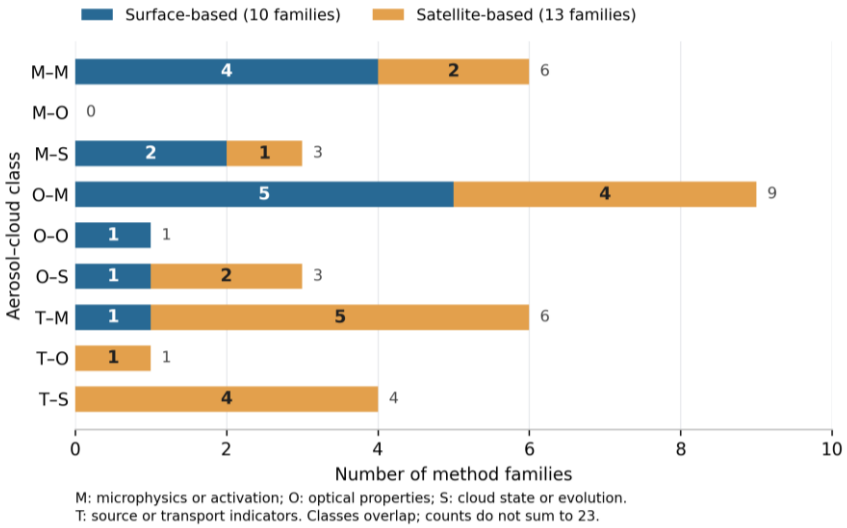

Figure 1: Number of ACI method families assigned to each aerosol–cloud class, distinguishing surface-based and satellite-based approaches. The first symbol denotes aerosol information and the second cloud properties. Method families may occupy multiple classes; therefore, counts do not sum to the 23 families in the inventory. Zero indicates no assignment within this inventory, rather than an absence of relevant literature.