

Deliverable 6.1 Recommendations for Data Policy

– A background document

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1 Content and purpose of this document

This document is a background document to the ACTRIS Data policy document (Deliverable D2.3). It is a working document and statements and conclusions are not final, but used as input and suggestions for consideration in the final ACTRIS Data Policy. This document is meant to reflect the status of the discussions on the data policy and is intended to provide additional information on aspects such as Intellectual property rights, licenses, and other legal issues related to access and use of ACTRIS data and digital tools. This document is expected to evolve until finalization of the ACTRIS data policy, but will not be submitted as a deliverable to EC more than once. *Cross-referenced text in the document is underlined.*

2 What is ACTRIS data?

“ACTRIS data” means the ACTRIS variables resulting from measurements that fully comply with the standard operating procedures (SOP), measurement recommendations, and quality guidelines established within ACTRIS. A list of ACTRIS variables and data is included in annex 1 and annex 2.

- ACTRIS level 0 data: Raw sensor output, either mV or physical units. Native resolution, metadata necessary for next level.
- ACTRIS level 1 data: Calibrated and quality assured data with minimum level of quality control.
- ACTRIS level 2 data: Approved and fully quality controlled ACTRIS data product or geophysical variable.
- ACTRIS level 3 data: Elaborated ACTRIS data products derived by post-processing of ACTRIS Level 0 -1 -2 data, and data from other sources. The data can be gridded or not.
- ACTRIS syntheses product (Proper name to be defined later): Data product from e.g. research activities, not under direct ACTRIS responsibility, but ACTRIS offer repository and access.

For ACTRIS data, the ACTRIS research infrastructure needs to be able to control all steps, e.g., formats and procedures including procedures for quality assurance, quality control, access, data policy, interoperability, licenses etc. ACTRIS services are offered to all levels, e.g., for level 0: calibration tests of instruments.

- **Since data produced by the National Facilities are owned by these, why can the National Facilities not do with their data whatever they want, including distribution to any user, particularly concerning ACTRIS level 0 data which is raw data from the National Facilities?**

Data originators are the only owners and are free to use their own data any way they like. ACTRIS is only given a right to use it through a license. Although they can use their data any way they like, they cannot distribute it and call it ACTRIS data, this right belong to ACTRIS. The following aspects should be noted:

- ACTRIS data is uniquely defined and ***the ACTRIS label on the data can only be given by the ACTRIS ERIC*** and all ACTRIS labelled data shall be provided through the Data Centre. ACTRIS controls i) all ACTRIS data levels and ii) all steps in the entire ACTRIS data lifecycle from data collection, to data processing and production, in order to fully comply with the quality guidelines established within ACTRIS and to ensure the high quality of ACTRIS data.
- ACTRIS level 0 data, although produced at the National Facility, has the 'ACTRIS' label as the data have been collected according to ACTRIS measurement guidelines and standard operating procedures. A National Facility wanting to provide access to their data (that was collected according to ACTRIS quality standards) may do so, however, they do not have the right to call the data ACTRIS data, even if the data is identical to ACTRIS level 0 data. They may not use the ACTRIS label, but they can use their National Facility data freely, and also add e.g. national license to the data.
- Data producers at National Facilities may make any special arrangements (contract/MoU/...) if needed to distribute ACTRIS data but only if made in agreement with ACTRIS ERIC and the ACTRIS DC.
- ACTRIS data includes ACTRIS level 0 data as this level is needed by ACTRIS for ensuring e.g., traceability.

3 Intellectual Property Rights and legal issues

- **Ownership and IPR.**

Ownership determines the rights and duties over property. Intellectual property rights (IPR) may be attached to property. Intellectual property laws are designed to protect such Intellectual Property (IP). IPR include copyrights, patents, trademarks, etc. The basic principle is that the one generating the IP owns the rights and provides access rights to users (= copyright owner). IPR give exclusive rights to the creators of the IP. IPR allows the creator to use and benefit from its own work. Copyright expires after a fixed period (in the EU 70 years from the death of the author).

- **What is a copyright owner?**

The copyright owner is the creator of the work (data, products, software...). Generally in the EU, the natural person who creates the work owns the copyright. Sometimes copyright can be vested in organisations as well. In some EU countries, the owner of the work can be stipulated in the employee's contract, often the institution where the work is created is considered as the owner (institutional ownership); in some countries no agreements are made; some countries have professor's privileges in which the researchers, students, etc. are entitled by law to the ownership of the work they created in the course of their employment (e.g., Italy, Sweden).

- **How do we deal with joint ownership?**

Joint ownership arises when several parties jointly develop work or intellectual good and their respective contribution to the final product cannot be ascertained or is indivisible. Joint ownership should be agreed on in specific contractual arrangements (joint ownership agreement).

- **Can data be considered Intellectual property?**

Datasets generated at the National Facilities (NF) can be considered IP, some might have been generated by multiple parties for which joint ownership principles apply.

- **What does it mean to transfer rights? How do we do that?**

Rights to all forms of Intellectual property (copyrights, trademarks, trade secrets, patents, ...) can be transferred in two ways: the user rights to IPR can be transferred under a license for a specified period of time (this implies the right to use and exploit the IP but maintains the ownership of the IP); or the property can be permanently transferred by way of an assignment (this implies that the ownership of the IP is assigned to the acquirer). The usual way of doing things is that the owner of the IP owns the rights and then provides the access rights to the users under certain conditions.

- **How is ownership defined for ACTRIS data? How do deal with jointly owned ACTRIS data?**

Ownership and IPR to ACTRIS data generated within ACTRIS belongs to that/those having generated it, in accordance with national legislations. Jointly owned ACTRIS data is defined by joint ownership. ACTRIS ERIC should aim at getting access rights to data from the National Facilities (NF) and Central Facilities (CF).

- **Does ACTRIS ERIC have rights on ACTRIS data and which?**

This depends how access rights for the ACTRIS ERIC will be defined. The data policy aims for the NF and CF to give to ACTRIS ERIC a worldwide, free of charge, perpetual, transferable, non-exclusive right to use for any purpose the ACTRIS data, Digital tools and related documents generated by them for ACTRIS. This right includes, but is not restricted to, the right to modify, reproduce, sublicense, incorporate to other data, other databases or other tools as well as produce new developments. This means, e.g., that the data and work resulting from access can be translated, modified, compiled, and remixed without legal barriers. An open access policy strives for open use and reuse for the purpose of promoting research, innovation, and knowledge production. If ACTRIS ERIC generates new developments they shall belong to the ACTRIS ERIC.

- **What does it mean that ACTRIS has the right to modify data? Why should ACTRIS allow modifying data? Is it not risky to allow altering the data?**

The right to modify data is linked to the copyright law in order to protect original work. Any

modification is only possible if either done by the owner or if specific rights are given to others using the data. The right to modify data does not include the right to falsify or alter the pure data and all use of data must be in line with the ACTRIS ethical guidelines and scientific integrity must always be followed and respected. Any derivative work, including modifications (e.g., calculating mean values of data) is based on copyrighted work and is only possible if respective permission is granted, e.g., in the form of a license. The copyright legislation may require the word modify to be specifically stated as user right, otherwise you do not have such right to do anything with the data. Licenses specify if derivative work is allowed. This should be allowed: if we prohibit derivative works, then i) users will not be able to remix and rearrange ACTRIS data or create new products based on available ACTRIS data, and ii) ACTRIS ERIC will not be able to make new developments based on ACTRIS data.

- **What happens if a EU Air Quality Directive (see European legislation on air quality for more information: http://ec.europa.eu/environment/air/quality/existing_leg.htm) adopts an ACTRIS protocol (i.e., concerning data collected under the AQDirective, also InSPIRE compliant with respect to metadata)?**

This depends on the license conditions of ACTRIS data and Digital tool. The goal is to have a Creative Commons license type (e.g., CC BY 4.) which would allow copying and redistribution of the material in any medium or format, as well as remixing and transformation for any purpose, even commercially.

4 Licenses

- **Who can issue licenses?**

Only the copyright owner can grant a license.

- **Are there different licenses for data and metadata, and databases? What are the practical consequences?**

Licenses for data, metadata, databases (and software) are different. Intellectual property is protected by the law of copyright. In Europe, databases are also protected by the “Sui generis” right (EU directive 96/9/EC) that grants the maker of any database a property right to prevent any unauthorized reproduction, distribution, reuse, ... of substantial parts of the database. The database rights do not exist in all countries (e.g., not existing in the US). Note that database rights after Brexit shall be affected in UK as it no longer is under the EU legislation. Specific open database licenses exist, e.g., the Open Data Commons.

- **What are Creative Common (CC) licenses?**

CC is a non-profit organisation that proposes legal and flexible solutions to give users the right to access, share, and use content and data. CC licenses are one of several public open license types placing few restrictions based on four different conditions:

Attribution (BY): allows copying, distributing, making derivative work, and remixing of work if credits are given to the author or licensor (in manner specified).

Share-alike (SA): allows distributing derivative work under an identical license (“not more restrictive”).

Non-commercial (NC): allows copying, distributing, making derivative work, and remixing only for non-commercial purposes.

No derivative works (ND): allows copying, distributing, and displaying, but does not allow making derivative work or remixing work.

The combination of the different conditions allows designing licenses that are more or less open. The most open (“all rights granted”) is the public domain waiver ‘CCO’. The least open reserves all rights to the copyright owner (“All rights reserved”). All CC licenses include the attribution condition (BY). The latest version of CC licenses is ‘CC BY 4.0’ is applicable to most jurisdictions and allows copying and redistribution of the material in any medium or format, and to remix, transform, and build upon the material for any purpose, even commercially.

- **Are there any drawbacks to using the attribution (BY)?**

CC BY gives you the right to use the licensed work, according to the CC licence type chosen, but always requires proper attribution. However, some data users might not like any attribution restrictions (e.g., Copernicus or commercial users). Furthermore, there is the issue of attribution stacking: in case of BY, any derivative work must acknowledge all contributors to each work from which it is derived, no matter how distantly. Thus, if a dataset is at the end of a long chain of derivations, or if large teams of contributors were involved, or if different sets of contributors have to be credited in a different way, the list of credits might be very long and complex. Alternatives would be to include a link to a web page that contains the attribution information, or entirely remove BY (thus, favour ‘CCO’) and specify some lightweight crediting mechanisms via citations.

- **Are there any drawbacks to using the share-alike condition (SA)?**

‘CC BY-SA’ reduces interoperability, as any derivations may only use the exact license.

- **What is the difference between Open Data Commons and Creative Commons?**

Open Data Commons (ODC) have specifically designed licenses for the protection of databases (but not for use on its content or data). Many databases are covered by copyright, and ODC licenses these rights. Examples: Open Database Licenses (ODbL) is a “share alike” license agreement intended to allow users to freely share, modify, and use a database while maintaining this same freedom for others, or Open Data Commons Attribution License (ODC-BY) is a license agreement intended to allow users to freely share, modify, and use the database, subject only to the attribution requirements.

Creative Commons originally intended to protect intellectual property. The latest version of Creative Commons, CC-BY 4.0, also includes the protection of databases (addressing more or

less the same needs as ODC).

- **What is the best license for ACTRIS data and which data should be licensed? What are NF data producers expected to do?**

Access to ACTRIS data is based on open access principles and should be fully available to users with as few restrictions as possible. The principle of open data is supported by the European Union's approach for use, reuse and redistribution of free, public data for both commercial and non-commercial purposes in order to stimulate the dialogue between the public and private sector, drive innovation, generate economic value, and foster socio-economic impact. ACTRIS supports the initiative to make its data more widely available for research, education, business, and other purposes. ACTRIS aims at using license types as Creative Commons CC BY 4.0 that allow copying, redistribution, remixing and transformation of the data for any purpose, however, attribution is required. NF and CF are expected to give ACTRIS ERIC a worldwide, free of charge, perpetual, transferable, non-exclusive right to use for any purpose the ACTRIS data, Digital tools and related documents generated by them for ACTRIS. This includes the right to modify, reproduce, sublicense, incorporate to other data, other databases or other tools as well as produce new developments.

- **Can one and the same data set have more than one license? What are likely options (e.g., multi-licenses, licences for commercial/non-commercial use, national licenses, ...)?**

- Licenses should be non-exclusive in which case the data owner can decide to provide the data under different terms. However, the data owner should realize that if data has been given on very open conditions to someone, anyone can receive that data on the same conditions from that source. If ACTRIS is given free user rights, ACTRIS can then decide whether it distributes data on a very open basis or with restrictions.
- In case of multiple licenses, for example, data may be licensed 'CC BY 4.0' to public users (who can do with the IPR whatever they like (and are only subject to attribution), and at the same time licensed 'CC BY-NC 4.0' to fee-paying users for commercial use. In this case, a licensee must seek permission from the IPR owner for commercial use and a financial compensation is conceivable (to cover costs for collecting, producing, disseminating). If ACTRIS is given user rights with restrictions it has to follow them. Nevertheless, ACTRIS will aim at avoiding multi-licenses and using licenses with similar kind of principles for both ACTRIS Data and the Digital tools.
- Data might also contribute to national networks (and funded by national authorities), and such data might also be associated with national licenses, and open and few/none restrictions is the most likely licence required. National ACTRIS consortia should aim at compatibility and coherence of the national ACTRIS data policy and the ACTRIS-EU data policy. One important argument for this, it to avoid that various versions of data distributed.

- **Does a license imply a restriction?**

This depends on the license type, which conditions the terms of distribution and use. For

example, Creative Commons (CC) licenses offer a wide license spectrum based on different conditions from very open (“all rights granted”) to very restricted (“all rights reserved”).

- **What is the difference between attribution and citation?**

Both attribution and citation are designed to provide credit to the originator of the IP. **Attribution** is a legal condition of use required by a license. Some of the licenses (e.g. Creative Commons Attribution, or CC BY) include attribution requirements. An attribution is the acknowledgement of the use of someone else’s information, data, or other work. Proper attribution credits the owner and, uniquely identifies data and its provenance. It is good practice to view the data license (found in the metadata) before using the data.

Citation is a reference required by the copyright legislation to a published source and acknowledges the work of someone else in a copyright protected work as defined in the copyright legislation (e.g., an article). Even if a data license does not require attribution, the use of citations may be required by the copyright legislation. Ethical practices should be considered when incorporating work of someone else in your own.

5 FAIR principles

- **FAIR, but what about Reliable? Fake data could absolutely be FAIR.**

The FAIR principles aims at increasing use and by this the reliability of data indirectly, as it aims to increase the transparency throughout the whole data provenance process, as well aiming at open access of all data and metadata. Still, the FAIR principles do not address quality of data directly, this has to be addressed elsewhere.

- **"Findable" should also mean that people who look for a certain parameter find it without knowing that it is available in the ACTRIS database.**

Finding ACTRIS data should be improved once all ACTRIS metadata is following well defined metadata standards. As an example ACTRIS provides part of its metadata for aerosol in-situ and trace gas in-situ to WMO WIS, and aiming at doing the same for WMO WIGOS, GEOSS and the EOSC (European Open Science Cloud). As a result parameters are available through global scientific hubs, and as a result, there is no need knowing about the ACTRIS database in order to find the data.

- **What if some ACTRIS data cannot be found (e.g., EC/OC data) despite knowing that this is an ACTRIS variable?**

In general all ACTRIS data (including EC/OC data) reported to ACTRIS/EBAS should be available through the ACTRIS data centre (available under the component names “elemental carbon” and “organic carbon”). The issue underlines the importance of having well defined metadata standards following commonly used vocabulary, e.g. CF standard names. Furthermore, data are only accessible from the data centre after QA and QC procedures are completed, often

including iterations between owner/data submitter and the data centre.

- **Is PID just a unique identifier (of a file etc.) or something more like a pointer?**

A PID is a unique identifier (DOI is an example of a PID) of an article, dataset, book etc. In many cases, e.g., in the case of a DOI, the PID points to a resource, e.g. a dataset stored on an ftp server or an article available through a journal.

- **Does FAIR distinguish between data and metadata?**

In order to meet the FAIR principles, data must be complemented by metadata. It is about combining data and metadata in order to facilitate good scientific data management. Both are covered by FAIR principles.

6 ACTRIS Data lifecycle and access to ACTRIS Data

- **AERONET promotes a concept of easy, fast and free data access (without licensing issues and/or other restrictions).**

Licenses do not a priori restrict access and use of data. Licenses clearly state the conditions of use of data. Licenses provide legal clarity about open data access, use, and sharing: unless you have a license specifying the data rights, users will not have permission to access, use and share (even public data) under copyright and database laws, for any purposes, commercial and non-commercial.

For example, open licenses place very few restrictions on what users can do with the data that are licensed (e.g., public domain licenses waive all owner rights). For open access to data the following principle should be applied: “the simpler the license, the better”. Nevertheless, licenses are important as they guarantee the benefits of open data, and they explicitly give the permission how to use data, products, work created by the owner. Licenses furthermore allow adequate attribution in order to properly acknowledge the data generator(s). Licenses ensure that user, according to the conditions of use, can i) use and republish data that someone else owns, ii) add value to the data, integrate data sets and the republish with the owner’s permission, or iii) recreate new products by adapting, deriving, or processing with the owner’s permission.

Open access increases visibility and the use of research results. Although the use of licenses is new to many users (research communities, networks, data providers, ...) it should not be seen as a barrier but help to clarify the access and use of the available data, and how to acknowledge/attribute the contributors, and not to restrict the use.

- **Not all users will follow a data user chart; nevertheless it does not matter, as AERONET data are very widely acknowledged and very widely used** (https://aeronet.gsfc.nasa.gov/new_web/data_usage.html).

Citation is good practice and encouraged, but should not be confounded with attribution.

- **ACTRIS National Facilities also submit data to EMEP, AMAP, and GAW. Will ACTRIS just be another database and how to deal with the presence of data in more databases?**

Only those data accessible through the ACTRIS Data Centre are considered ACTRIS data. The ACTRIS Data Centre is the only entry point to access ACTRIS data. ACTRIS data cannot be provided through other data portals. Concerning data other than ACTRIS data: in general, data is not submitted to multiple instances as indicated above. Instead the same data is submitted to one instance (e.g. EBAS), where the data is associated with multiple projects (EMEP, AMAP, GAW, ACTRIS etc.), if, and only if, the data comply with the requirements within the various frameworks. This will then be a part of the metadata, the data itself is just stored in the EBAS database. This is an important principle to avoid duplications and various versions of data distributed to users. There could be multiple entry points to the same data, and metadata could be stored in multiple databases, but the primary data archive is the identical. As a result, a user could access ACTRIS data through multiple entry points, like EBAS data portal, ACTRIS data portal or some metadata harvesting service like WMO WIS or WMO WIGOS. This is also another argument why licenses with few restrictions are crucial. Therefore, it will often appear as if data is stored in multiple databases, although this is not the case, since all point to the same source.

- **Data originators should be able to distribute certain L0 and L1 data.**

The ACTRIS Data Centre is the data provider and source for ACTRIS data L0-L1-L2-L3. The ACTRIS data centre provides access, but not all levels will be freely accessible through the ACTRIS data centre web interface, but on request. For L0 data, special procedures might apply, following protocols that are available from the DC. Level 0 data are to be submitted and archived at the Data Centre unless otherwise agreed and foreseen in the ACTRIS Data Management Plan e.g., in case of large raw data volumes. Data originators own the data and can distribute the data as they want, but cannot call it ACTRIS data, unless agreements and contracts are made with the ACTRIS Data Centre.

Access to data products for users is through the DC.

- *Example 1: data exchange with manufacturer for fault detection / technical problem solving.* This can be done using preliminary data prior to submission to the data centre, or using NRT data in parallel to the distribution to the data centre, but not call it ACTRIS, or by setting up a delivery from the data centre, if needed. Both options are possible, depending on the need/request.
- *Example 2: data exchanges between NFs and TC, and upstream of transmission to DC.* This can be a part of the data production processes and workflow, and should be described in the workflow to have clear roles and distribution of work. These data should not be public and distributed to users outside the data production workflow, and will not have the final ACTRIS data label (as it is a part of the data production chain).
- *Example 3: exchange of N-RRT information within the framework of other research*

programs (e.g., national/regional air quality initiatives) or in operational frameworks, particularly in case of need of information to implement emergency measures during pollution episodes. ACTRIS NRT data, labelled "ACTRIS", is provided by the ACTRIS DC, or by a smaller ACTRIS DC sub-unit if so agreed by contract with the ACTRIS DC, following the protocols, data policy and licenses that are associated. Exchange of N-RRT information within the framework of other research programs or in operational frameworks can be set up by the DC in collaboration and interaction with the associated TC. Agreed workflows describe the QC and QA procedures for N-RRT data.

- **Why is ACTRIS Level 1 data restricted by default?**

L1 is restricted by default, which means that password or tailored delivery based on MoU for larger data volumes is required. The reason why L1 data is password protected is to avoid mix with L2 data, which are final quality assured data. L1 data will be available for all scientific purposes upon request, with no restrictions, but with a disclaimer on the quality of the data. The L1 data should not be used as fully quality assured data, but will be used for production of L2. L1 can also be used for production of new data products etc. The scientific community is granted full access to all level 1 data, e.g. further development of data production tools, QA/QC tools. The L1 data will be associated to licenses to ensure proper acknowledgement/attribution.

- **What does restricted access mean? Is password restricted?**

Restricted access means that data is not openly accessible, without password. Access in general may be controlled using passwords via i) authentication (identification of the user) and ii) authorization (determination if the user has the permission to access specific data). Additionally, iii) embargo can be implemented to restrict access to specific data for a given period of time. Access to ACTRIS data is based on the open access principle. ACTRIS aims at implementing as few restrictions as possible, e.g., only for specific data sets or when access could jeopardize a potential industrial/commercial use, or violate the rules on personal data protection, confidentiality, for security reasons, or other legitimate reasons. Under ACTRIS, there will be no authorization (i.e., evaluation of users), only information on the use of data and like limitation of the quality of NRT data. However, tailored delivery (e.g. regular transfer of data of larger volumes/ many sites/ many instruments) will require a specific procedures e.g. machine-to-machine interface, and requests should be made through SAMU, according to the access policy. For technical reasons, access to very large amounts of data may also be limited for a certain time if downloaded excessively.

- **Level 3 data quality is not completely under ACTRIS control. Why should Level 3 data be "ACTRIS" data?**

Level 3 data can be considered ACTRIS data, as it results from elaborated ACTRIS data products derived by post-processing of ACTRIS Level 0 -1 -2 data, and data from other sources, but produced by ACTRIS partners as a contribution to ACTRIS (e.g., based on national ACTRIS research funding). This is a decision of the data producer. ACTRIS ERIC does not own data from

other sources, thus, access rights for ACTRIS ERIC to such data (considered third party data) must be previously agreed between the owner and ACTRIS ERIC. ACTRIS aims at offering such data products as ACTRIS level 3 data (or tools etc.). **Does "ACTRIS data" also include data set validation by the TCs?**

The ACTRIS Data Centre provides, in close collaboration with the TC, support to NFs for validation of data in form of data quality assurance, data quality control, following predefined and standardized procedures and tools.

- **How can we ensure to attribute all entities involved in the data production workflow?**

Within ACTRIS it is important to ensure that those having generated the data and tools are adequately acknowledged. The most feasible technical solution will be sought for attaching identifiers to the ACTRIS Data and to the Digital tools together with clear information about the possibilities for acknowledging those that have contributed to producing the data. The responsibility for those who should receive credits lies on the data owner, submitting the data. However, the data centre will need to put in place a system for organising the best solution for proper attribution.

ACTRIS expects attribution also in case when substantial amount of metadata is harvested by external metadata services. More detailed rules for defining substantial and how to handle these situations will be provided in the [Data Management Plan](#). Substantial amount can be, e.g., all data for a 1-year period from all sites, or one type of variable for all years, etc. ACTRIS as the source for data should be attributed, so that the data can be found if needed.

- **ACTRIS Data Management Plan (DMP)**

ACTRIS is documenting each step of the ACTRIS data lifecycle, including collection, curation, data production, preservation, publishing and use of data. Details of the data lifecycle and data management are provided in the ACTRIS DMP.

- **ACTRIS data from the National Facilities and the Topical Centres shall be submitted to the Data Centre within a specified deadline after the measurements are performed. It is not clear if this refers to all data (raw, L1, L2, L3, NRT) or just L2?**

ACTRIS data are uniquely defined and include all data levels 0, 1, 2, 3. Details for submission deadlines and production schedule will be included in the data management plan. Raw data are considered ACTRIS level 0 data if produced according to ACTRIS measurement guidelines, (including, e.g., required calibration of relevant instruments at the ACTRIS Topical Centres). ACTRIS NRT data are ACTRIS level 1 data which are restricted and accessible via password by default.

- **ACTRIS L1 NRT data is property of the institution: the institution should be allowed to distribute this data without agreement from ACTRIS ERIC or ACTRIS DC.**

ACTRIS NRT data are ACTRIS L1 data that are calibrated and quality assured data with a minimum level of quality control. Although ACTRIS L1 data are owned by the National Facilities

and not by the ACTRIS ERIC (ACTRIS ERIC is only given a right to use the data provided by the National Facilities), they were produced from ACTRIS L0 data in collaboration with the ACTRIS Data Centre and/or the ACTRIS Topical Centres (e.g., for calibration of instruments, for providing tools for data quality assurance and quality control (e.g. outlier detection, closure etc.), and for data production). The production of L1 data varies for various types of data, e.g., cloud remote sensing data, aerosol remote sensing data, aerosol in situ data, and is in some cases produced within the DC. As equivalent NRT data without the ACTRIS label are a priori not available, NRT data are ACTRIS-labelled and are, thus, provided by the ACTRIS DC, or by ACTRIS DC units via contract with the DC. Nevertheless, exemptions may be granted if otherwise agreed, e.g., through specific contracts, MoUs, or similar with the ACTRIS ERIC and the ACTRIS DC. ACTRIS (and thus the ACTRIS members) have the full control over the data production chain and access and provides the ACTRIS label.

- **Specific needs for RRT/NRT data (Level 1 data)**

The DC concept indicates that “For restricted level 1 data, ACTRIS will offer common license models, taking into account that there may be different needs for RRT/NRT data, which are specified in the data policy”. This is currently not addressed in the data policy but will be detailed in the ACTRIS Data Management Plan (DMP). During the writing period of the DC concept description, the schedule was to have a more detailed data policy ready in M30. This is changed due to the need for submission of ERIC step 1 proposal. Hence, the data policy is less detailed, and more specifications will be included in the data Management Plan due M32.

7 Open access

- **Does open access allow access by any type of user, including commercial users?**

Open access concerns all types of users. A user is a person, a team, or an institution from any sector, including public and private sector, to use ACTRIS data or other ACTRIS services, including access to ACTRIS facilities. More precisely, ACTRIS users may be affiliated with the organisations:

- (1) Public research organisations, universities and higher education organisations, international organisation, and other non-profit private research organisations;
- (2) Public services (any persons from organisations and institutions that are owned or supported by the government, other than academia & public research organisations);
- (3) Private companies and businesses;
- (4) Other, e.g., including any other citizens or persons from institutions that are non-governmental, or non-profit or that do not belong to any of the above categories.

- **Data produced using public funding is basically owned by the public.**

Data produced using public funding is, according to the EU copyright law, still owned by the

creator of the data who owns the copyright related to the data. However, it is expected that ACTRIS data, financed with public means, is fully available for others to use with as few restrictions as possible.

- **Should access to some data be restricted, e.g., some specific restrictions on some subsets of data might be needed? This needs to be explored before open access to all data.**

Access to some ACTRIS services is open and free, most importantly the access to ACTRIS data, data products, and digital tools provided by the DC. This concerns access to all ACTRIS L2 data and access to some standard ACTRIS L3 data (for more information, see Concept of the ACTRIS Data Centre). L0 data is accessible on specific request (also depending on the variable), L1 data is restricted by default as no manual quality assurance and quality control is performed. NRT data is a typical level 1 data, and should not be mixed with fully QA and QC data. Hence, L1 data is restricted by default, but access can and will be provided upon contracts, negotiations and MoU etc. Other access, e.g., to specific tailored data and services, is available on demand and is considered competitive access and might involve user fees. Open access is the general principle, ACTRIS might waive the right to some restrictions to subsets of data (including also for example ACTRIS preliminary data).

Restrictions that are still in line with open access principles may be implemented for specific data sets, especially when access to them could jeopardize a potential industrial/commercial use, violate the rules on personal data protection or on confidentiality for security reasons; or for any other legitimate reason. These restrictions are decided case by case and negotiated with the data originators. More detailed rules for allowed restrictions can be provided later if needed.

- **How can we trace the users if access is not authenticated?**

We can still track the number of accesses by IP, but only anonymous. In general, we can separate between anonymous users (regular use and download of data without any access restriction, authenticated users (registration to access), and authorized user (user must be approved to get access, e.g. to ACTRIS preliminary data). It should also be taken into account that unnecessary personal information gathering should be avoided as it brings along quite strict responsibilities.

- **Login vs IP tracking: in EUROCHAMP, there is "no login access" AND optional "ORCID access". This allows for identified users to be informed of any updates of, for example, the downloaded data.**

Open access to data should avoid any mechanisms to restrict access. ACTRIS uses IP tracking for obtaining user statistics without authentication through password provision.

8 Annex I: Catalogue of ACTRIS level 1 and level 2 data and detailed description

Annex I: Catalogue with ACTRIS L1-L2 data from observational NF	Colour codes for measurement techniques	
	Variable produced from a single measurement technique	
	Variable produced from synergy of measurement techniques	
	Variable produced from synergy of measurement techniques where combinations are possible	

ACTRIS variable	NF requirements Mandatory - M Specializing - S Optimum - O	Data level	Topical Centre	Data produce r	operational in RRT now RRT-S = scheduled from 2025	Time resoluti on	Integrating Nephelometer	Particle Size Spectrometer	Optical Particle Size Spectrometer	Absorption Photometer	Particle Counter	Scanning PSM, (N)AIS, N-MPSS	Particle Size Magnifier (PSM)	Cloud Condensation Nuclei Counter	Filter sampling	Thermal-optical analyser	filter-based Offline IC- GC-MS- HPLC-MS. LC/MS	Aerosol Mass Spectrometer	Particle Induced X-ray Emission
Particle light scattering and backscattering coefficients	M	L0, L1, L2	CAIS	NF	NRT-O	1h													
Particle number size distribution - mobility diameter	M	L0, L1, L2	CAIS	NF	NRT-O	1h													
Particle number size distribution - optical and aerodynamic diameter	S	L0, L1, L2	CAIS	NF	NRT-S	1h													
Particle light absorption coefficient and equivalent black carbon concentration	M	L0, L1, L2	CAIS	NF	NRT-O	1h													
Particle number concentration	S	L0, L1, L2	CAIS	NF	NRT-S	1h													
Nanoparticle number size distribution	S	L0, L1, L2	CAIS	NF	NRT-S	1h													

ACTRIS variable	NF requirements Mandatory - M Specializing - S Optimum - O	Data level	Topical Centre	Data produce r	operational in RRT now RRT-S = scheduled from 2025	Time resoluti on	Integrating Nephelometer	Mobility	Particle	Size	Particle	Size	Aerodynamic & Optical Particle Size Spectrometer	Absorption Photometer	Particle	Condensation Counter	Scanning PSM, (N)AIS, N-MPSS	Particle Size Magnifier (PSM)	Cloud Condensation Nuclei Counter	Filter sampling	Thermal-optical analyser	filter-based	Offline IC-GC-MS. HPLC-MS. LC/MS	Aerosol Mass Spectrometer	X-Ray Fluorescence, Particle Induced X-ray Emission
Aerosol in situ																									
Nanoparticle number concentration	S	L0, L1, L2	CAIS	NF	NRT-S	1h																			
Cloud condensation nuclei number concentration	S	L0, L1, L2	CAIS	NF	NRT-S	1h																			
Mass concentration of particulate organic and elemental carbon	S	L2	CAIS	NF	-	<48h - 2/week																			
Mass concentration of particulate organic tracers	S	L2	CAIS	NF	-	<48h - 2/week																			
Mass concentration of non-refractory particulate organics and inorganics	S	L2	CAIS	NF/TC	NRT-S	1h																			
Mass concentration of particulate elements	S	L1, L2	CAIS	NF	-	<48h - 2/week																			

ACTRIS variable	NF requirements Mandatory - M Specializing - S Optimum - O	Data level	Topic Centre	Data produc er	RRT-O= operational in RRT now RRT-S = scheduled from 2025	Time resolution	Mobility Particle Size Spectrometer	Condensation Particle Counter	Integrating Cloud Probe	Cloud Droplet Probe	Cloud Ice Probe	Aerosol Particle Sampler	Bulk collectors	INP instrument
Cloud in situ														
Liquid Water Content	M	L0, L1, L2	CIS	NF	NRT-S	1 min								
Droplet effective diameter	M	L0, L1, L2	CIS	NF	NRT-S	1 min								
Droplet number concentration	S	L0, L1, L2	CIS	NF	NRT-S	1 min								
Droplet size distribution	S	L0, L1, L2	CIS	NF	NRT-S	1 min								
Interstitial particle number concentration	S	L0, L1, L2	CIS	NF	NRT-S	1 Min								
Interstitial particle size distribution	S	L0, L1, L2	CIS	NF	NRT-S	20 min								
Total particle number concentration	S	L0, L1, L2	CIS	NF	NRT-S	1 Min								
Total particle size distribution	S	L0, L1, L2	CIS	NF	NRT-S	20 min								
Cloud residuals number concentration	O	L0, L1, L2	CIS	NF	NRT-S	10 min								
Cloud residuals composition	O	L1, L2	CIS	NF	NRT-S	1 h								
Ice particle number concentration	S	L0, L1, L2	CIS	NF	NRT-S	1 min								
Ice particle size distribution	S	L0, L1, L2	CIS	NF	NRT-S	10 min								

ACTRIS variable	NF requirements		Data level	Topic Centre	Data producer	RRT-O= operational in RRT now RRT-S = scheduled from 2025	Time resolution	Mobility Particle Size Spectrometer	Condensation Particle Counter	Integrating Cloud Probe	Cloud Droplet Probe	Cloud Ice Probe	Aerosol Particle Sampler	Bulk collectors	INP instrument
	Mandatory - M	Specializing - S													
Cloud in situ															
Ice nucleating particle number concentration	S		L0, L1, L2	CIS	NF	NRT-S	1 h								
Ice nucleating particle temperature spectrum	S		L1, L2	CIS	NF	NRT-S	<= 24 h								
Bulk cloud water chemical composition	S		L1	CIS	NF	NRT-S	<= 24 h								

ACTRIS variable	NF requirements Mandatory - M Specializing - S Optimum - O	Data level	Topical Centre	Data producer	RRT-O= operational in RRT now RRT-S = scheduled from 2025	Time resolution	On-line GC-FID	On-line GC-MS	On-line GC-FID/MS	On-line GC-Medusa	On-line PTR-MS	On-line Hantzsch	Off-line traps: ads-tubes	Off-line traps: DNPH-cartridge-HPLC	Off-line steel canister	Off-line glass flask	NO-O ₃ chemiluminescence	Potentially other measurement technique supported by the TC	Cavity Attenuated Phase Shift Spectroscopy (CAPS)	CI-API-TOF
Trace gases in situ																				
NMHCs	M*, O	L0, L2	CGas-SiM	NF	NRT-S	1 h-2/week														
OVOCs	M*, O	L0, L2	CGas-SiM	NF	NRT-S	4 h-2/week														
Terpenes	M*, O	L0, L2	CGas-SiM	NF	-	1 h-2/week														
NO	M	L0, L1, L2	CGas-SiM	NF/TC	NRT-S	1h														
NO2	M	L0, L1, L2	CGas-SiM	NF/TC	NRT-S	1h														
Condensable vapours	O*, S	L2	CGas-SiM	NF/TC	NRT-S	10 min														

ACTRIS variable	NF requirements Mandatory - M Specializing - S Optimum - O	Topic Centre	Data producer L1, L2	RRT-O= operational in RRT now RRT-S = scheduled from 2025	Time resolution	Approx. height resolution for remote sensing data	High-power aerosol lidar	Automatic sun/sky/lunar photometer
Aerosol remote sensing								
Attenuated backscatter profile	M	CARS	DC	NRT-S	1h, 5/week	60 m		
Volume depolarization profile	M	CARS	DC	NRT-S	1h, 5/week	60 m		
Particle backscatter coefficient profile	M	CARS	DC	NRT-S	1h, 5/week	60 m		
Particle extinction coefficient profile	M	CARS	DC	NRT-S	1h, 5/week	60 m		
Lidar ratio profile	M	CARS	DC	NRT-S	1h, 5/week	60 m		
Ångström exponent profile	O	CARS	DC	NRT-S	1h, 5/week	60 m		
Backscatter-related Ångström exponent profile	O	CARS	DC	NRT-S	1h, 5/week	60 m		
Particle depolarization ratio profile	M	CARS	DC	NRT-S	1h, 5/week	60 m		
Particle layer geometrical properties (height and thickness)	M	CARS	DC	NRT-S	1h, 5/week	60 m		
Particle layer optical properties (extinction, backscatter, lidar ratio, Ångström exponent, depolarization ratio, optical depth)	M	CARS	DC	NRT-S	1h, 5/week	60 m		

ACTRIS variable	NF requirements Mandatory - M Specializing - S Optimum - O	Topic Centre	Data producer L1, L2	RRT-O= operational in RRT now RRT-S = scheduled from 2025	Time resolution	Approx. height resolution for remote sensing data	High-power aerosol lidar	Automatic sun/sky/lunar photometer
Column integrated extinction	M	CARS	DC	NRT-S	1h, 5/week	60 m		
Planetary boundary layer height	O	CARS	DC	NRT-S	1h, 5/week	60 m		
Spectral Downward Sky Radiances	M	CARS	TC	NRT-O	1h	NA		
Direct Sun/Moon Extinction Aerosol Optical Depth (column)	M	CARS	TC	NRT-O	15min	NA		

ACTRIS variable	NF requirements Mandatory - M Specializing - S Optimum - O	Data level	Topic Centre	Data producer L1, L2	RRT-O= operational in RRT now RRT-S = scheduled from 2025	Time resolution	Approx. height resolution	High-power aerosol lidar	Automatic low-power lidar and	Doppler cloud radar	Radiosonde	Microwave radiometer	Doppler lidar	Drop-counting rain gauge	Disdrometer	NWP model input required
Cloud remote sensing																
Radar reflectivity factor	M	L1	CCRES	DC	RRT-O	30s	60m									
Radar Doppler velocity	M	L1	CCRES	DC	RRT-O	30s	60m									
Radar Doppler spectral width	M	L1	CCRES	DC	RRT-O	30s	60m									
Radar linear depolarisation ratio	O	L1	CCRES	DC	RRT-O	30s	60m									
Attenuated backscatter profile	M	L1	CARS	DC	RRT-O	30s	60m									
Cloud/aerosol target classification	M	L2	CCRES	DC	NRT-O	30s	60m									
Drizzle drop size distribution	M	L2	CCRES	DC	NRT-O	30s	60m									
Drizzle water content	M	L2	CCRES	DC	NRT-O	30s	60m									
Drizzle water flux	M	L2	CCRES	DC	NRT-O	30s	60m									
Ice water content	M	L2	CCRES	DC	NRT-O	30s	60m									
Liquid water content	M	L2	CCRES	DC	NRT-O	30s	60m									

ACTRIS variable	NF requirements Mandatory - M Specializing - S Optimum - O	Data level	Topic Centre	Data producer L1, L2	RRT-O= operational in RRT now RRT-S = scheduled from 2025	Time resolution	Approx. height resolution	High-power aerosol lidar	Automatic low-power lidar and	Doppler cloud radar	Radiosonde	Microwave radiometer	Doppler lidar	Drop-counting rain gauge	Disdrometer	NWP model input required
Dissipation rate of TKE (turbulent kinetic energy)	O	L2	CCRES	DC	NRT-S	30s	60m									
Atmospheric boundary layer classification	O	L2	CCRES	DC	RRT-S	3 min	60m									
Liquid water path	M	L1,L2	CCRES	DC	NRT-O	30s	-									
Temperature profile	O	L1,L2	CCRES	DC	NRT-O	30s	variable									
Relative humidity profile	O	L1,L2	CCRES	DC	NRT-O	30s	variable									
Integrated water vapour path	O	L1,L2	CCRES	DC	NRT-O	30s	-									

ACTRIS variable	NF requirements Mandatory - M Specializing - S Optimum - O	Data level	Topic Centre	Data producer L1, L2	RRT-O= operational in RRT now RRT-S = scheduled from 2025	Time resolution	Approx. height resolution	single FTIR	double FTIR	UVVIS-ZenithSky	UVVIS MAXDOAS	O3 DIAL
Trace gases remote sensing												
Ozone profile	O	L2	CREGARS	NF	-	1 day	few hundred meters to few km					
Ozone partial columns	O	L2	CREGARS	NF	-	< 30 min	5 to 8 km					
Ozone column	M	L2	CREGARS	FTIR: NF; UVVIS: TC	UVVIS: NRT-S	< 30 min	NA					
Formaldehyde column	M	L2	CREGARS	FTIR: NF; UVVIS-MAXDOAS: TC	UVVIS MAXDOAS: NRT-S	< 30 min	NA					
Formaldehyde lower tropospheric profile	O	L2	CREGARS	TC	NRT-S	< 30 min	few hundred meters to few km					
NO2 column	M	L2	CREGARS	FTIR: NF; UVVIS: TC	UVVIS: NRT-S	< 30 min	NA					
NO2 partial columns	S	L2	CREGARS	FTIR: NF; UVVIS: TC	UVVIS: NRT-S	< 30 min	stratospheric column					
NO2 lower tropospheric profile	O	L2	CREGARS	TC	NRT-S	< 30 min	few hundred meters to few km					
NH3 column	S	L2	CREGARS	NF	-	< 30 min	NA					
C2H6 column	M	L2	CREGARS	NF	-	< 30 min	NA					

9 Annex II: Catalogue with ACTRIS level 3 data products

ACTRIS level 3 data product name	Expected user community	Aerosol/ Cloud/ Trace gas	Profile: P	ACTRIS L0-L2 data:		Required data and source for the product	Time resolution	RRT/QA assured data used	Status O= operational from 2025. S= Support required from supporting projects
	A = Academia B =Business and industry P = policy makers, authorities, etc.		Total column: C In situ: S	Obs	Model product - M Earth observation - EO				
ACTRIS level 2 products based on observations									
Aerosol columnar properties	A	Aerosol	C	Obs	ACTRIS L1 and/or AERONET	1h	QA, NRT	S	
Aerosol profile microphysical and optical properties	A	Aerosol	P	Obs	ACTRIS L1 and/or AERONET	1h	QA	S	
Column Water Vapour Content	A	Trace gas	C	Obs	ACTRIS L1 , AERONET	15min	QA	O	
Climatology products for ACTRIS variables @ ACTRIS National Facilities across Europe	A, P	Aerosol/T race gas	S, P	Obs	ACTRIS L2	daily	QA	S	
Calculated Particle light scattering coefficients	A	Aerosol	S	Obs	ACTRIS L2	1h	RRT, QA	O	
Collocation service of data from contributing networks	A, P	Aerosol	S	Obs	ACTRIS L2, EMEP		QA	O	
PM retrieval @GAW sites	A, P	Aerosol	S	Obs	ACTRIS L2	1h/daily	QA	S	
Single Scattering Albedo @ACTRIS National Facilities	A, P	Aerosol	S	Obs	ACTRIS L2	1h	QA	S	

ACTRIS PPP

WP6 / Deliverable 6.1

ACTRIS level 3 data product name	Expected user community	Aerosol/ Cloud/ Trace gas	Profile: P	ACTRIS L0-L2 data: Obs Model product - M Earth observation - EO	Required data and source for the product	Time resolution	RRT/QA assured data used	Status O= operational from 2025. S= Support required from supporting projects
	A = Academia B =Business and industry P = policy makers, authorities, etc.		Total column: C In situ: S					
Calculated particle light extinction coefficient	A	Aerosol	S	Obs	ACTRIS L2	1h	RRT, QA	S
Integrated full-range particle number size distribution	A	Aerosol	S	Obs	ACTRIS L2	1h	RRT, QA	S
Source apportionment of submicron organic aerosols in Europe	A, P	Aerosol	S	Obs	ACTRIS L2	1h, daily	QA, NRT	S
Volatile Organic Compounds (VOC) source attribution across Europe	A, P	Trace gas	S	Obs-M	ACTRIS L2	yearly	QA	S
Cloud occurrence at cloud in situ observational platforms	A, P	Cloud	S	Obs	ACTRIS L2	10 min	QA	O
Direct Sun/Moon Extinction Aerosol Optical Depth (column)	A	Aerosol	C	Obs	AERONET L1	15min	QA, NRT	O
Spectral Downward Sky Radiances	A	Aerosol	C	Obs	AERONET L1	15min	QA, NRT	O
ReOBS	A	Aerosol/ Cloud/ Trace gas	P, C, S	EO-Obs-M	ACTRIS L1 & L2, AERONET, METEOSAT, ...	1h	QA	S
Satellite data – combined with ground based ACTRIS data	A, P	Aerosol	P, C, S	EO-Obs	ACTROS L2, MODIS, PARASOL, CALIPSO, CloudSat, OMI, MISR, Envisat/AATSR, IASI, MSG/SEVIRI	daily/monthly	QA	O

ACTRIS level 3 data product name	Expected user community	Aerosol/ Cloud/ Trace gas	Profile: P	ACTRIS L0-L2 data: Obs Model product - M Earth observation - EO	Required data and source for the product	Time resolution	RRT/QA assured data used	Status O= operational from 2025. S= Support required from supporting projects
	A = Academia B =Business and industry P = policy makers, authorities, etc.		Total column: C In situ: S					
ACTRIS level 3 data products involving regional and global models								
Aerosol and Gas trend assessment	A, P	Aerosol/T race gas	C,S	Obs-EO-M	ACTRIS L2, /AERONET/AEROCOM/CAMS	daily	QA	O
Data Interpretation and Outlier Identification Tool	A, P	Aerosol/T race gas	S	Obs-M	EBAS/CAMS	daily	RRT, NRT, QA	O
Optimal interpolation and Gap filling tool	A	Aerosol	P, C, S	Obs-M	ACTRIS L2/AEROCOM	daily	QA	S
Model Evaluation Service	A	aerosol, cloud	P, C, S	Obs-M	ACTRIS L2/AERONET/AEROCOM/ICAP/ SDSWAS	daily	QA	O
NWP Model Evaluation Service	A	Cloud	P, C, S	Obs-M	ACTRIS L2/NWP Models	1-3h	NRT,QA	O
Transport modelling products for assessment of source regions	A	Aerosol/T race gas	P, C, S	M	ECMWF + FLEXPART	3h	-	S
Alert Service for National Facilities	A	Aerosol, cloud	P, C, S	M	CAMS/SDSWAS/CAP	1h	NRT	S