

# Open Science and its importance in Weather Analysis

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# Overview

- Recap of different Data Sources for Weather Analyses in Africa
- What exactly is Open Science
- Key Principles of Open Science
- Open Collaboration
- Some Key Challenges in collecting and sharing data in Africa
- How can Open Science address these Challenges
- African Contribution to Open Access Research
- The African Open Data Platform Initiative

# Recap of Different Data Sources for Weather Analyses in Africa

- **Ground-based observations from Meteorological stations** across the continent collect ground-based weather data such as temperature, humidity, wind speed, and precipitation. Eg., African Centre of Meteorological Applications for Development (ACMAD) and national meteorological agencies provide crucial real-time data for localized weather analysis.
- **Satellite observations** provide comprehensive coverage of weather patterns across Africa, including cloud cover, precipitation, temperature, and atmospheric composition. Eg., European Space Agency's (ESA) Sentinel satellites, NASA's MODIS (Moderate Resolution Imaging Spectroradiometer), and EUMETSAT's Meteosat series.
- **Reanalysis datasets** combine historical weather data with modern climate models to provide continuous, long-term weather records. Eg., ERA5 from the European Centre for Medium-Range Weather Forecasts (ECMWF), are invaluable for studying climate trends and variability in Africa.

# Carbon Flux measurement by Researchers at UENR



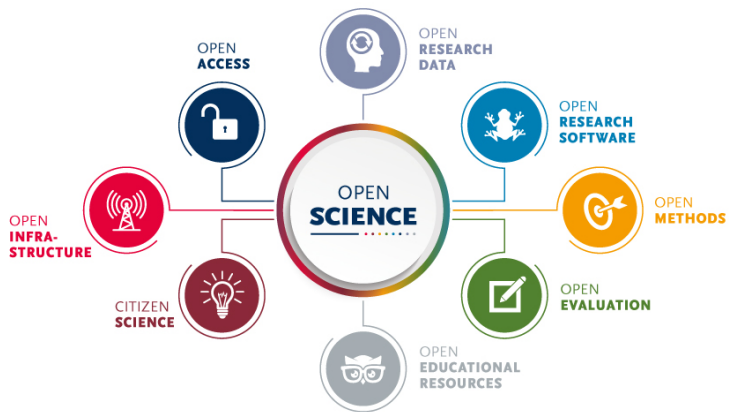
# What exactly is Open Science?

- **Open Science** is a movement that aims to make scientific research, data, and findings accessible to everyone (like a big, friendly library where everyone can share and use knowledge for free).
- This means that research papers, datasets, software, and other scientific outputs are shared openly and freely available for anyone to read, use, and build upon.
- Shorthand for four fundamental goals:
  - ▶ Transparency in experimental methodology, observation, and collection of data.
  - ▶ Public availability and reusability of scientific data.
  - ▶ Public accessibility and transparency of scientific communication.
  - ▶ Using web-based tools to facilitate scientific collaboration.

# Key Principles of Open Science

- **Open Access:** Research papers and articles are freely available without subscription fees.
- **Open Data:** Datasets of various weather and climatic parameters used in atmospheric research are shared publicly for verification and further analysis.
- **Open Source:** Weather analyses Softwares and tools developed for research are shared with open licenses.
- **Open Methodology:** Research methods and protocols are transparently documented.
- **Open Peer Review:** The process of reviewing scientific work is transparent and accessible.
- **Citizen Science:** Involvement of the general public in scientific research projects.

# Open Science



## Benefits of Open Access Publishing



This is a derivative of the original work 'Benefits of Open Access' CC BY Danny Kingsley & Sarah Brown



## Different types of Open Access (OA)

- The colors of Open Access were adopted at the beginning of the OA movement but can confuse.
- The words given to each type or color of open access carry certain connotations that subtly imply the validity of different types of open access.

# OPEN ACCESS

## GOLD ROUTE



Published in Open Access Journal

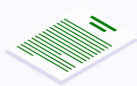


Author pays Article Processing Charge (APC) if required



Immediate open access

## GREEN ROUTE



Published in Subscription-based Journal



Author self-archives articles in an open repository



Immediate or delayed access

## HYBRID ROUTE



Some articles are subscription-based and some articles are open to access



Author pays Article Processing Charge (APC) if required



Immediate open access

# Journals in the field of Atmospheric and Climate Science under OA Category

- **Gold OA (GOA):** Atmospheric Chemistry and Physics (ACP)- a journal with EGU, Climate (MDPI), npj Climate and Atmospheric Science (part of Nature Partner Journal series).
- **Green OA (GOOA):** Journal of Geophysical Research Atmospheres (American Geophysical Union), International Journal of Climatology (Royal Meteorological Society), Quarterly Journal of Royal Meteorological Society.
- **Bronze OA (BOA):** Journal of Climate (American Meteorological Society), Bulletin of the American Meteorological Society, Geophysical Research Letters.
- **Hybrid OA:** Climate Dynamics (Springer), Journal of the Atmospheric Sciences (American Meteorological Society), Environmental Research Letters (IOP Publishing).
- **Diamond/Platinum OA:** Atmosphere (Korean Meteorological Society), Advances in Atmospheric Sciences, Elementa- Science of the Anthropocene (University of California)

# How to determine the type of OA

- Check the journal's main website and visit "About", "Open Access" or "Author Guidelines" sections to access policies and licensing information.
- Use Trusted Directories and Databases such as the Directory of Open Access journals (DOAJ) which lists all fully access journals with their colour codes.
- Explore Specific Publisher Platforms (Springer, Elsevier, Wiley) to check for OA options and filter by Open Access type.
- Tools and Resources like CrossRef and Open Access Button to verify OA Status using DOI

# Challenges and Considerations of OA in Atmospheric and Climate Science

- Costs associated with different Open Access models.
- Licensing and copyright considerations.
- Navigating publisher policies and embargo periods.

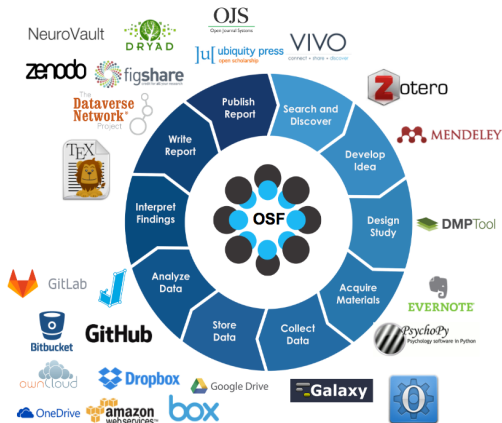
# Why open data?

- Publicly funded research
- “Democratic” access to data
- Research transparency/integrity
- Reduced duplicated data collection
- Accelerated progress and innovation



# Open Research: Research Cycle

- The Open Science Framework (OSF) is an open-source platform designed to help researchers manage and share their projects.
- It acts as a central hub (source code is available) where researchers can collaborate, organize their work, store data, and track project progress.
- Higher Education Institutes, library consortia, research councils, and granting councils are pivotal in supporting and regulating research output and Open Access initiatives.



# Benefits of Open Science Framework

- Version control across the whole project
- Server locations in multiple countries, including Canada
- Ability to establish a project structure or clone an existing project
- Sustainable access to your project (read-only at least) guaranteed for the next fifty years
- Control over project access at the project, folder, or file level with a highly granular level of control for projects that may not be able to be fully open
- Ability to easily add collaborators outside of your institution
- Digital Object Identifier (DOI) creation at the project level
- Ability to “pre-register” a project, which essentially takes a snapshot of a project’s details and provides useful information for future researchers who may be interested in building on the work



# Types of Peer Review



## BLIND

*Single blind:* Reviewers know the authors' identities, but reviewer names are protected.

*Double-blind:* Reviewer and author names are protected.



## SIGNED

Reviewers sign their comments. Authors receive reviewer names in the decision letter.



## COLLABORATIVE

Reviewers collaborate and submit joint comments, or in some cases confer with authors and editors during the review process.



## PORTABLE

Reviewers are sought by an organization or journal and shared with any journals that require them later on.



## PUBLISHED

Reviewer comments and/or names are published with the article or preprint.



## POST-PUBLICATION

After a manuscript is posted the community reviews the research in an open forum. Reviewer names are usually published with their comments.



[plos.org/resources/for-reviewers/](https://plos.org/resources/for-reviewers/)



# Citizen Science

- Citizen Science is when everyday people (non-professional scientists) contribute to scientific research by collecting data, making observations, or analyzing results.
- Scientists can gather more data over larger areas and longer periods than they could on their own.



# Zooniverse

- **Zooniverse** enables global volunteers to engage in real scientific research.
- Participants perform tasks like identifying objects, transcribing documents, or classifying data that computers find challenging.
- Hosts projects across fields such as astronomy, ecology, climate science, medicine, and humanities.
- Zooniverse volunteers contributes directly to advancing scientific research and discoveries.



# Open Collaboration

- **Collaborative Problem-Solving:** Open collaboration involves people working together, sharing ideas and resources freely to solve problems.
- **Inclusive Participation:** Anyone can contribute - professionals, hobbyists, or interested individuals - by offering skills, knowledge and time.
- **Online Platforms:** These Open collaboration occurs on platforms like Wikipedia, GitHub, and open-source communities, enabling teamwork across distances.

# Challenges in Collecting and Sharing Data in Africa

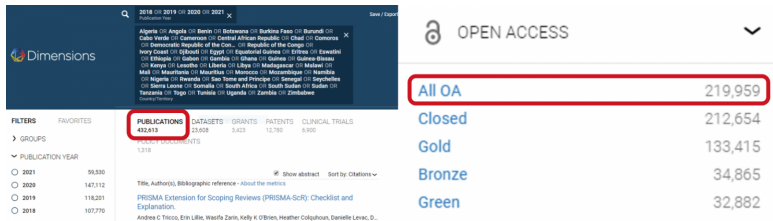
- **Limited Infrastructure and Technology:** Lack of weather stations, sensors, and high speed internet connectivity hampers accurate data collection.
- **Funding Constraints:** Limited budget prevent investment in advanced technology and skilled personnel.
- **Political and Institutional Barriers:** Data sharing is restricted due to concerns over ownership, national security, or commercial interests, complex administrative procedures, etc.
- **Data Standardization and Quality Issues:** Inconsistent data formats and protocols complicate integration of data from different sources. Poor data quality due to inadequate training and resources reduces reliability.
- **Lack of Awareness and Capacity Building:** Limited training in modern data techniques restricts the use of advanced methods and tools.

# How can Open Science address these Challenges

- **Improving Infrastructure and Access:** Crowdsourcing data (engage local communities in data collection via mobile devices and accessible technologies) and Shared Platforms.
- **Facilitating Funding and Resource Sharing:** Collaborative Grants (open science attracts international collaborations and funding). Open-Access tools reduce costs, enabling high-quality research without relying on expensive proprietary software.
- **Overcoming Political and Institutional Barriers:** Open Science platforms facilitate cross-border collaboration while addressing concerns over data ownership and privacy.
- **Enhancing Data Standardization and Quality:** Open science promotes standardized data collection and sharing protocols, improving data integration and comparability. Peer review and community-driven efforts in open science also enhance data reliability.
- **Building Awareness and Capacity:** Open science offers free training, workshops, and resources to build skills in data collection and sharing.

# African contributions to Open Access Research

- African researchers have embraced Open Access, producing over 400,000 publications since 2018, with 50% being Open Access.
- The steady increase in research output highlights the continent's growing role in global knowledge sharing.



# The African Open Data Platform Initiative

- Collaborative Effort (led by ICSU and CODATA) to promote open data use across Africa.
- Enhances African countries' ability to collect, manage, and utilize data for development, research, and policy-making.
- Accessibility to scientific and socio-economic data.
- Training and Best Practices data management, analysis, and sharing.
- Establishing data repositories, improving interoperability, and ensuring data security and privacy.
- Fostering Collaboration among African nations, international organizations, and research institutions.





*Thank you for your attention*

