

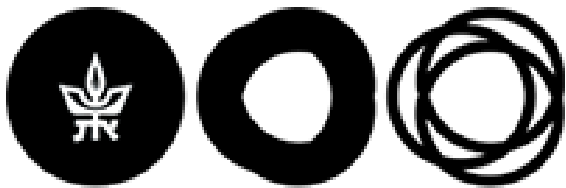
Wireless Communication for Good: ***A global initiative leveraging network signal measurements for rainfall monitoring***

Prof. (Emerita) Hagit Messer

School of Electrical and Computer Engineering, Tel Aviv University

<https://www.messer.sites.tau.ac.il/>

**AI and frontier technologies for good,
ITU Kaleidoscope academic conference, Geneva, Switzerland, 7-9 July 2026**



TEL AVIV אוניברסיטת
UNIVERSITY תל אביב



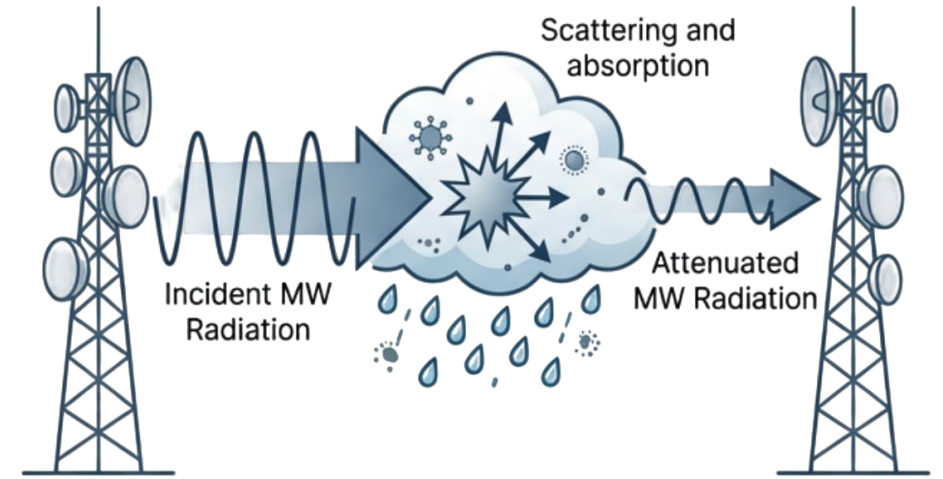
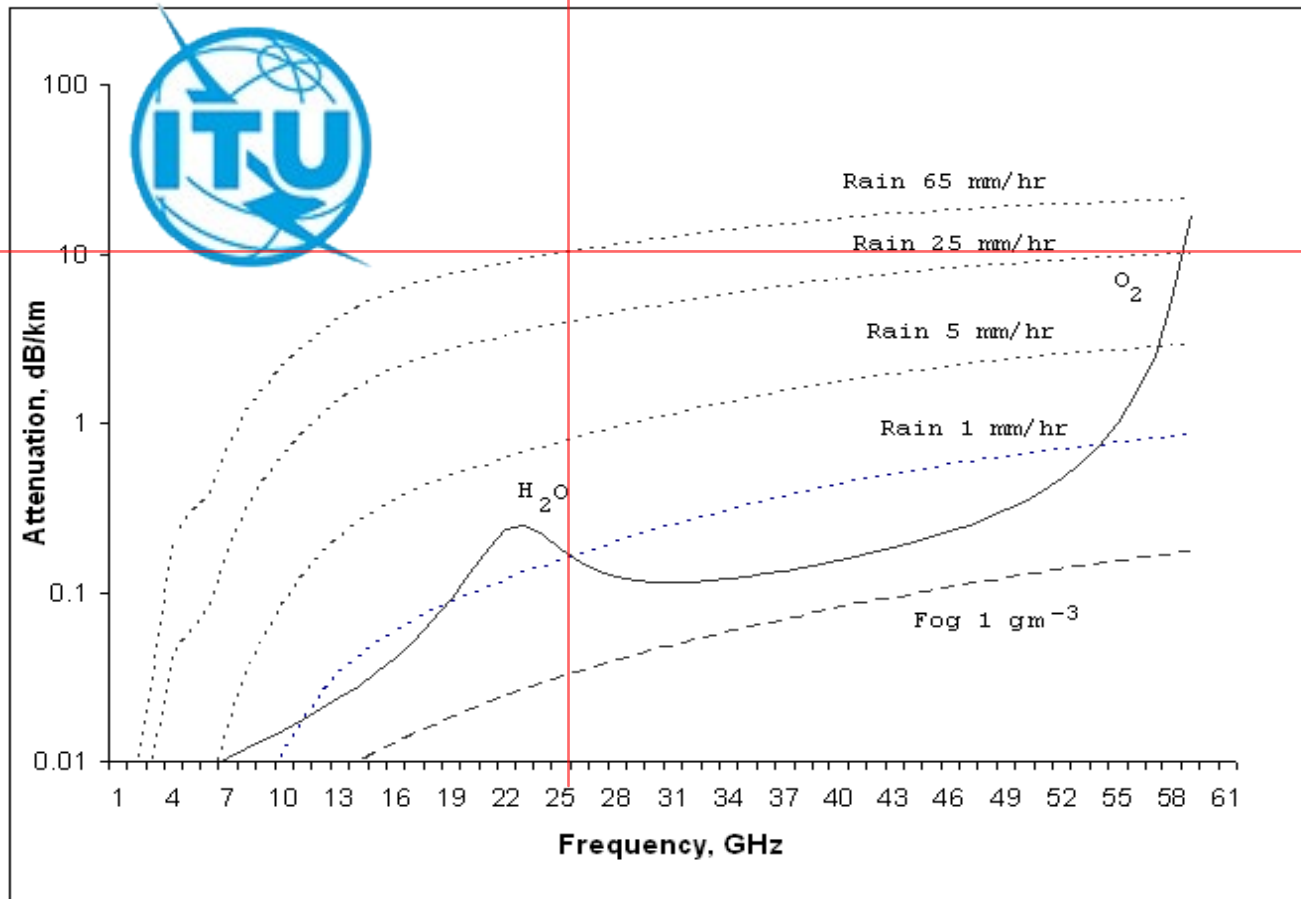
Web: <https://gmdi.eu/>
Email info@gmdi.eu



Funded by
the European Union

FROM WIRELESS COMMUNICATION TO WEATHER

Signal attenuation due to environmental phenomena has always been a challenge for wireless network design



The idea: CMLs can be used as Meteorological Sensors

RAIN SENSING FROM CML'S SIGNAL LEVEL: THE BEGINNING:

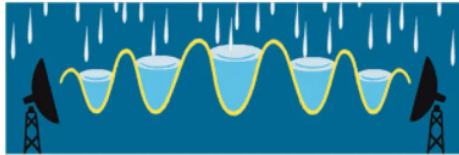
Messer, Hagit, Artem Zinevich, and Pinhas Alpert. "Environmental monitoring by wireless communication networks." *Science* 312, no. 5774 (2006): 713-713.

Science

The New York Times

OBSERVATORY

Counting Dropped Calls and Drops of Rain



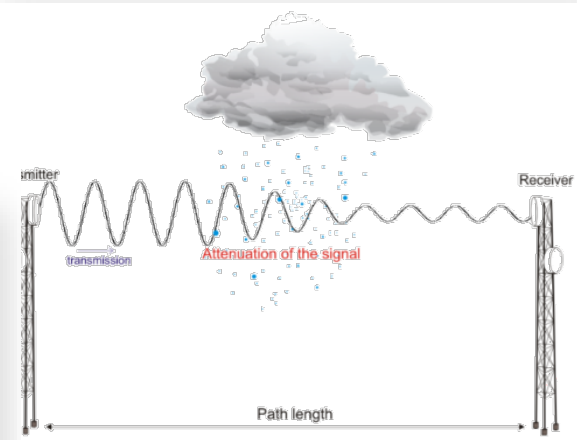
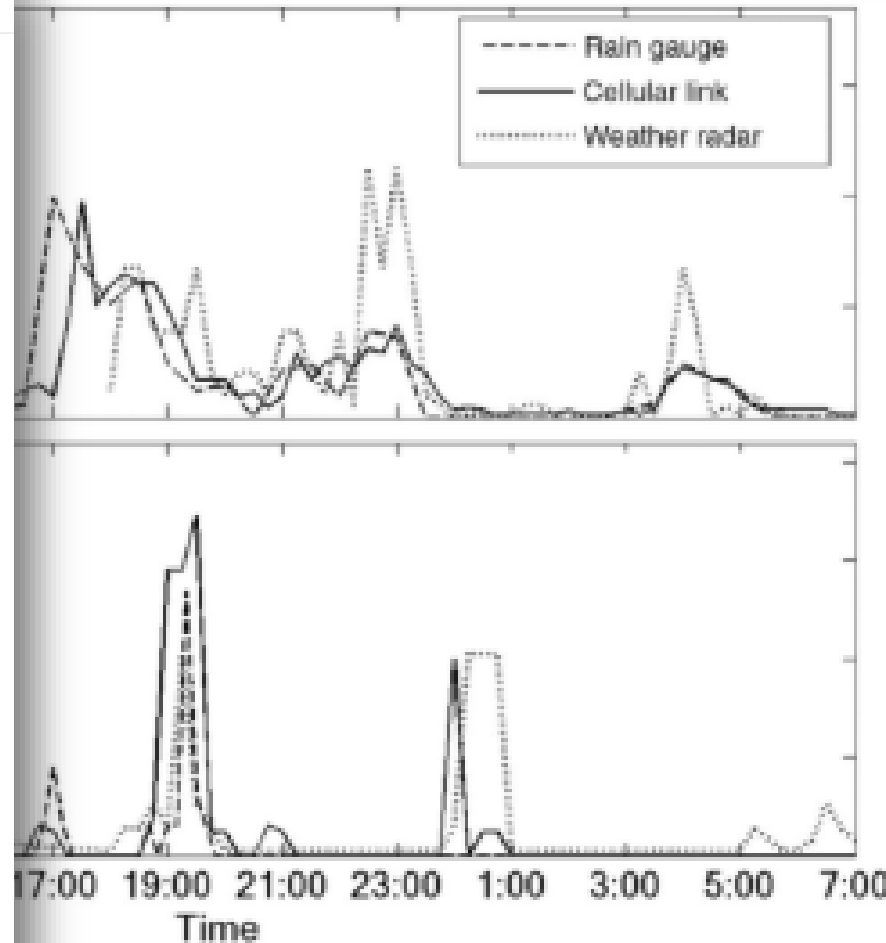
Chris Gash

By Henry Fountain

May 9, 2006

Take heart, cellphone users. All those dropped calls you experience may someday be used for a greater good: to help forecast the weather.

That's the suggestion of an Israeli electrical engineer, Hagit



$$A[dB] = aR^b L$$



FROM WEATHER TO WIRELESS COMMUNICATION

Water Resources Research

Rapid Communications |  **Free Access**

Rainfall measurement using radio links from cellular communication networks

[H. Leijnse](#) , [R. Uijlenhoet](#), [J. N. M. Stricker](#)

First published: 23 March 2007 | <https://doi.org/10.1029/2006WR005631> | [VIEW METRICS](#)

Accessibility issue? [Request accessibility update](#).

 SECTIONS

 PDF  CITE  TOOLS 

Abstract

[1] We investigate the potential of radio links such as employed by commercial cellular communication companies to monitor path-averaged rainfall. We present an analysis of data collected using two 38-GHz links during eight rainfall events over a 2-month period (October–November 2003) during mostly stratiform rainfall in the Netherlands. Comparisons between the time series of rainfall intensities estimated using the radio links and those measured by a nearby rain gauge and a composite of two C band weather radars show that the dynamics of the rain events is generally well captured.

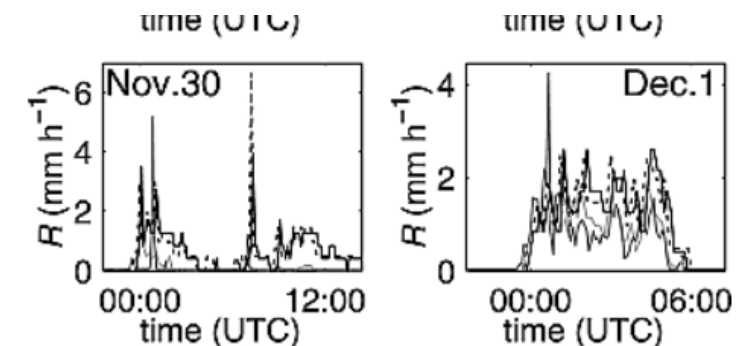
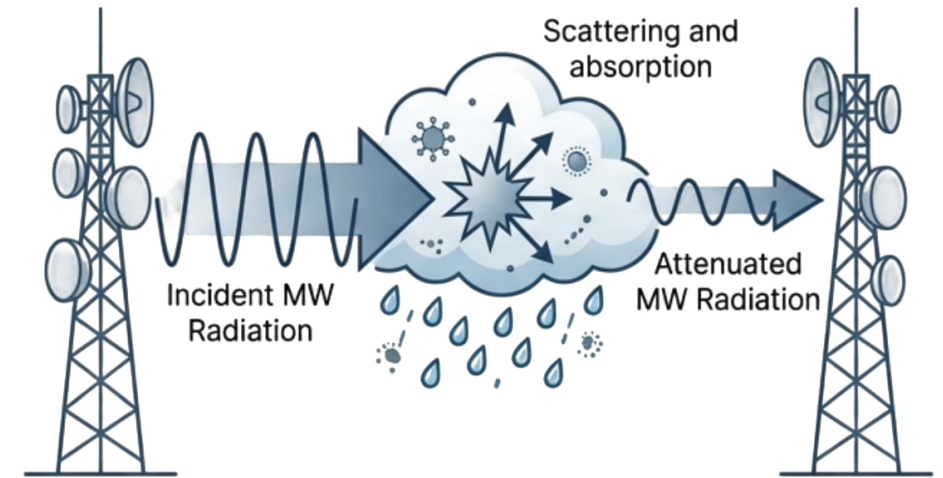
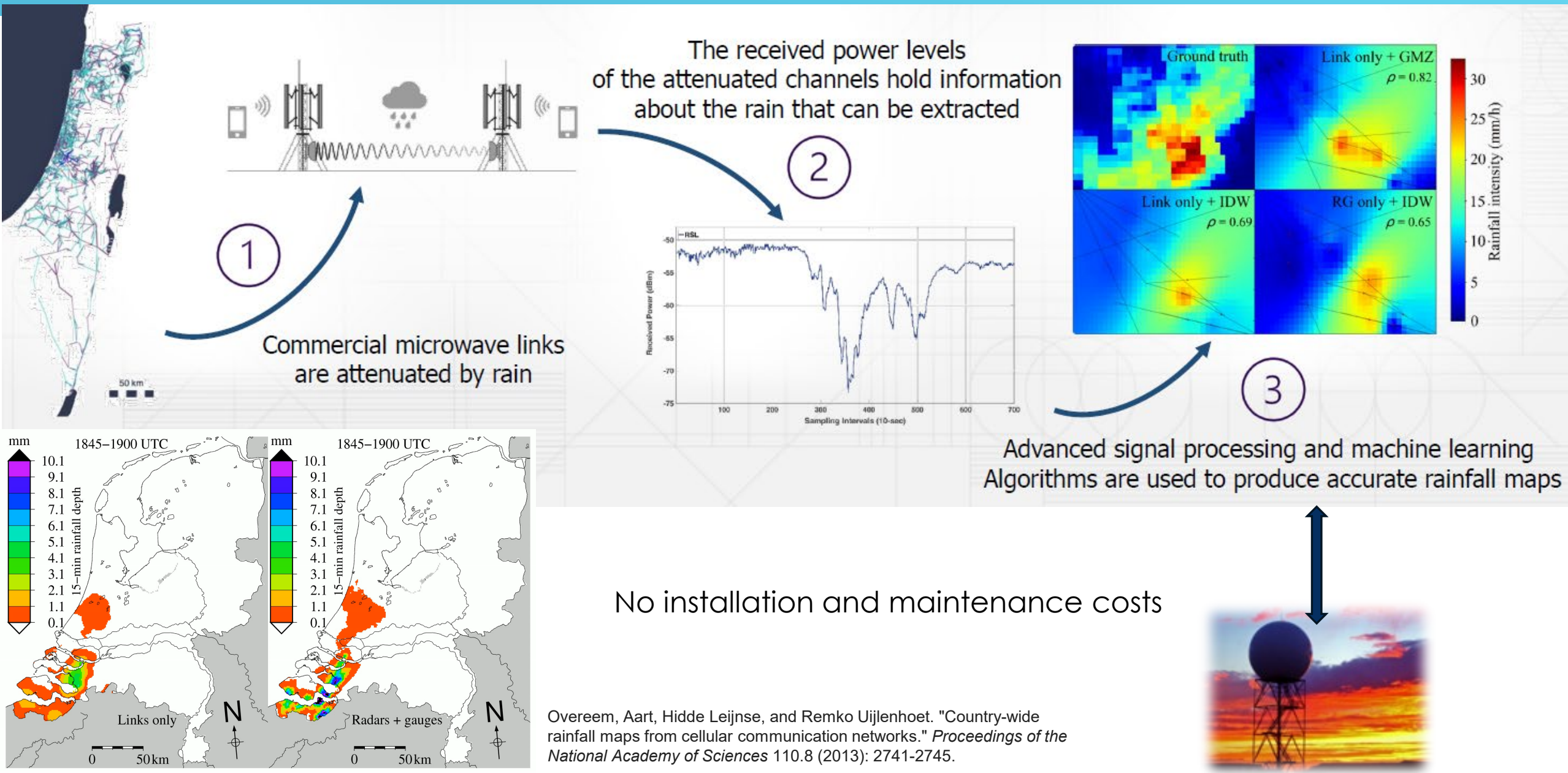


Figure 3

[Open in figure viewer](#) | [PowerPoint](#)

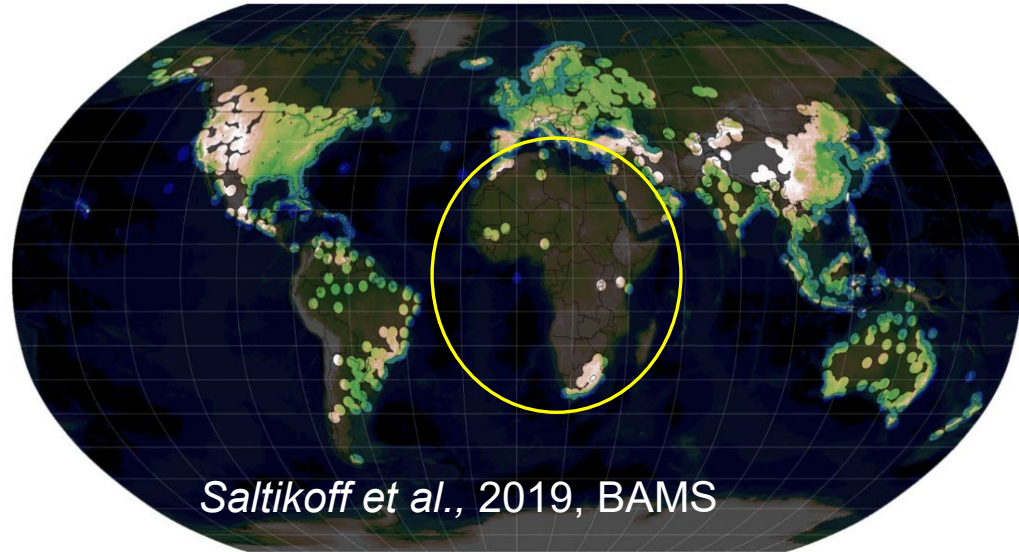
Time series of rainfall intensities estimated by the two links 0409-0398 (solid line) and 1047-0398 (dashed line) and those measured by the rain gauge (light gray line) and the radars (rl, see caption of [Table 1](#), dark gray line) for the eight selected events.

The leading application: a wireless network as a virtual weather radar



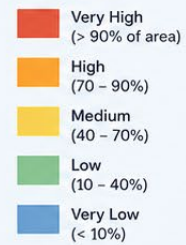
THE OPPORTUNITY

Global coverage of weather radar



Global coverage of cellphone towers

BACKHAUL INFRASTRUCTURE COVERAGE



Coverage refers to estimated outdoor availability of telecom backhaul connectivity and does not guarantee service quality or capacity.

WHAT THE MAP SHOWS

Estimated geographic availability of telecom backhaul infrastructure using microwave links and tower sites.

- Based on location of telecom towers and microwave backhaul links
- Microwave link reach: typical 15 – 50 km per hop
- Data sources: Global Microwave Database, OpenCellID, ITU, and industry datasets (May 2024)

WORLD POPULATION WITH BACKHAUL COVERAGE



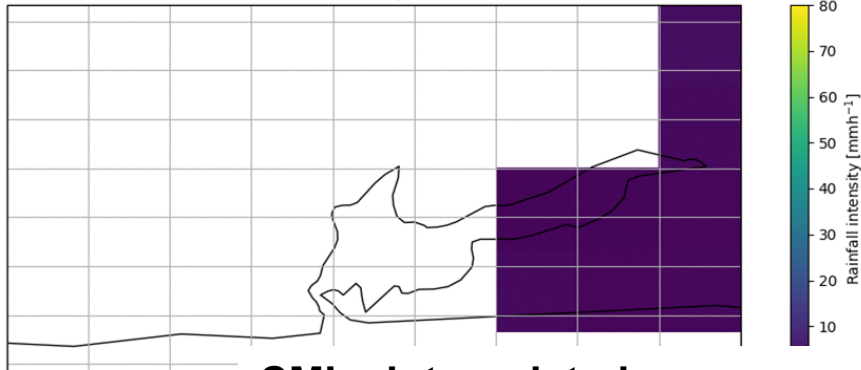
Source: Analysis May 2024

A SPECIAL CASE OF INTEREST: AFRICA

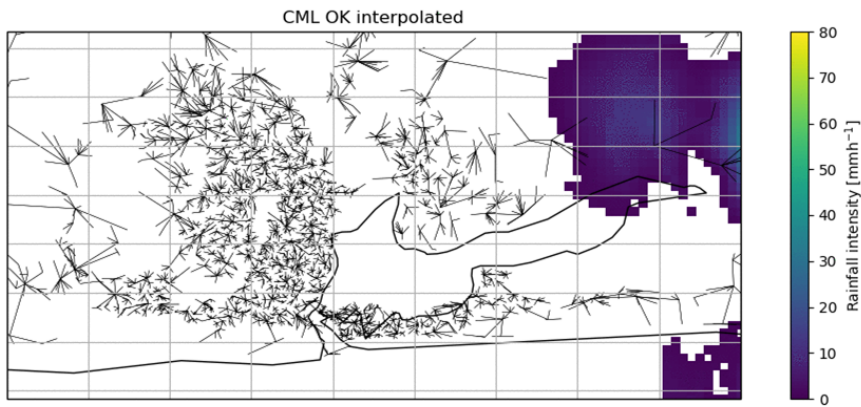
Satellite (GPM IMERG)

Rainfall intensity 2019-03-06 10:45:00 UTC

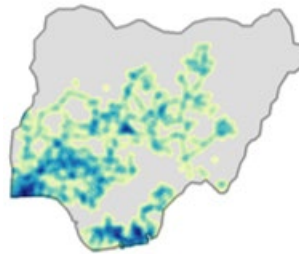
GPM IMERG gridded



CMLs interpolated



CML

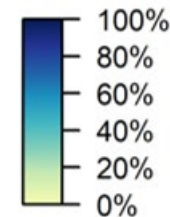


RG



0 200 km

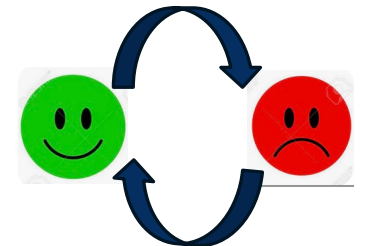
coverage



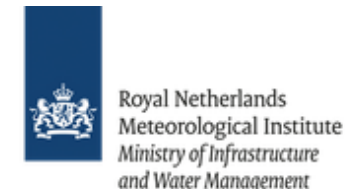
Dr. GOSSET, IRD, FRA

Lessons learned from 10 years of CMLs experiments in Africa:

- Patience and resilience
- Up and downs



Nigeria - Lagos



Wireless Communication for Good?

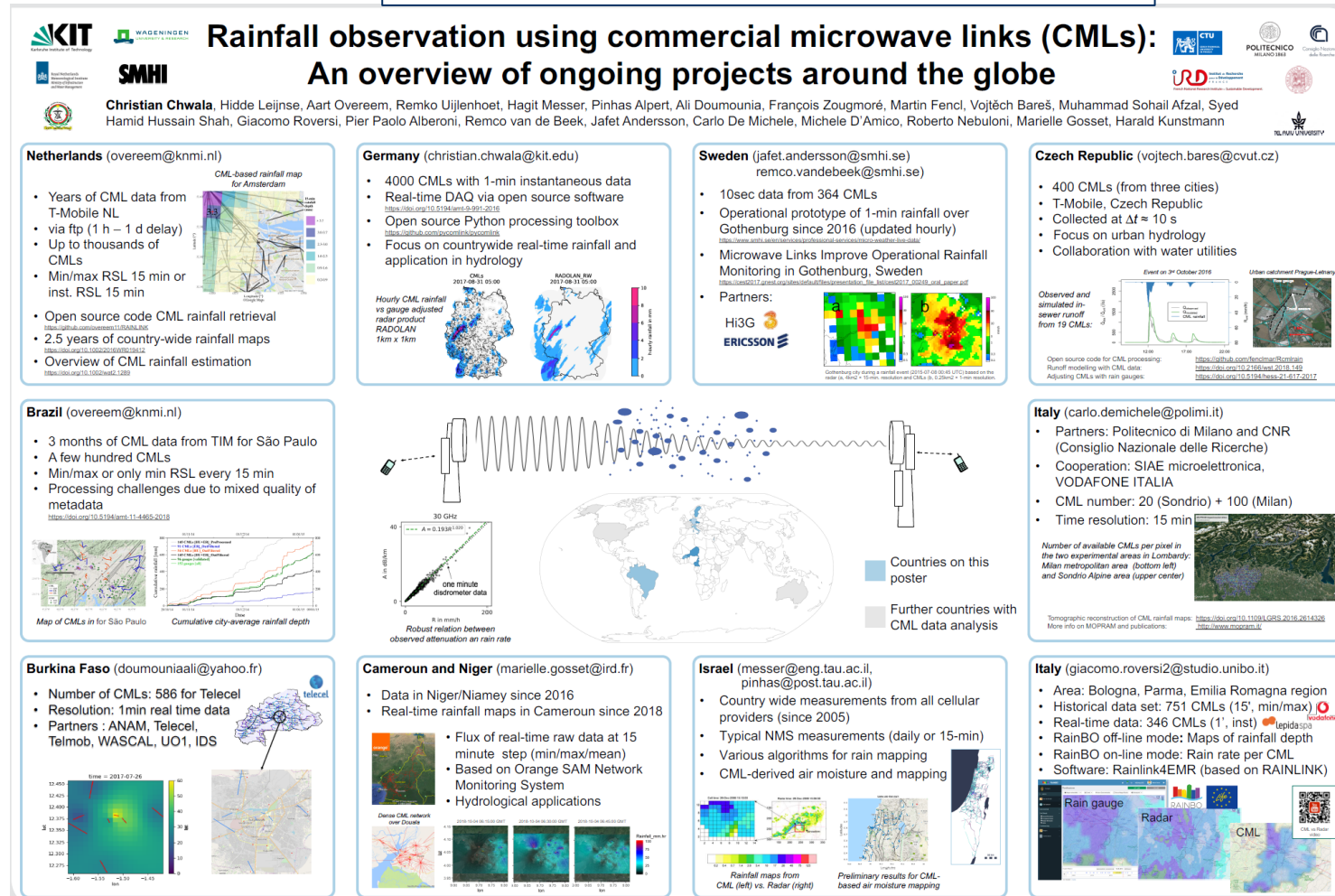
Numerous R&D groups have advanced the proof of concept locally, but still its operational use is limited.

Identified challenges include:

- Barriers from the NMOs point of view
- Barriers from the end-users' point of view

What is done to deal with these challenges?

IPWG 2018, Seoul, 05.11.2018





OpenSense

Opportunistic Precipitation
Sensing Network
(OPENSENSE)

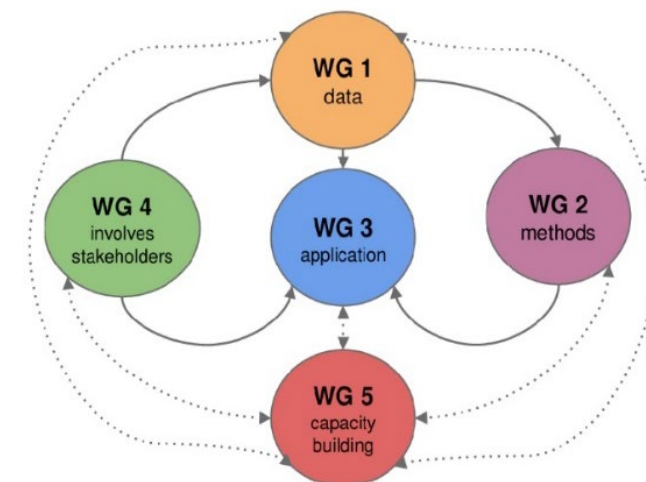
<https://opensenseaction.eu/>

Opportunistic Sensors (OS):
CMLs, SML, PWS

«OPENSENSE» OBJECTIVES

The main "OpenSense" objectives are to:

- improve the access to continental OS observations,
- establish OS as a widely acknowledged method capable of providing reliable operational rainfall data,
- facilitate the use of the OS data for weather and hydrological forecasts.



Improved access to
continental OS observations

OS capable of providing
reliable operational
precipitation observations

OS used in precipitation
nowcasting and operational
hydrological forecasts



The 1st OpenSense Joint Meeting
in Prague in June 2022

ACTION PARTICIPANTS

Over 100
participants.
The Management
Committee is
formed of 52
participants from 31
countries, 16 of
which are COST
Inclusiveness Target
Countries.



Countries with MC
Representatives

Action Details

MoU - 076/21

CSO Approval date - 25/05/2021

Start date - 13/10/2021

End date - 12/10/2025

<https://opensenseaction.eu/>

SETTING UP GLOBAL MICROWAVE LINK DATA COLLECTION INITIATIVE: SET-GMDI PROJECT

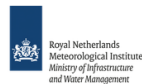


Funded by
the European Union



GMDI Objectives:

- *Lower technical barriers for data transfer*
- *Motivate (financially) MNOs to share data*
- *Improve access for end users*
- *Integrate research & development*



ITUEvents

SetGMDI kick-off meeting

Establishing the global microwave link data collection initiative

26 November 2025
9:00- 17:00 CET
Geneva, Switzerland

Co-organized by:



<https://gmdi.eu/>

GMDI Global Microwave Link
Data Collection Initiative

cost
EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY



Funded by
the European Union

Home

About

Pilot studies

GMDI-CAP system

Governance

SetGMDI – A founding project of the Global Microwave link Data Collection Initiative



Current GMDI status

GMDI Pilots with real data

GMDI-CAP system prototype ready

ITU Report in progress

GMDI Pilots with real data

Country	Operator	Data characteristics
Czechia	T-Mobile	Real-time, dt = 1 min
Germany	Telefonica	Real-time, dt = 15 min
Ghana	AT Ghana	Real-time, dt = 15 min
Cameroon	Orange Cameroon	Historical, dt = 15 min
Italy	Lepida	Real-time, dt = 1 min



SetGMDI Stakeholder Workshop — First Results & Community Building

Please save the date for the SetGMDI Workshop, to be held on Monday, 22 June 2026, at the Royal Netherlands Meteorological Institute (KNMI) in De Bilt, the Netherlands.

Mobile network operators share pilot case study experience. Discussion with national weather services, water industry, hardware vendors, and international authorities (WMO, ITU) on next steps toward GMDI.

SetGMDI Workshop

22 June 2026,
the Netherlands

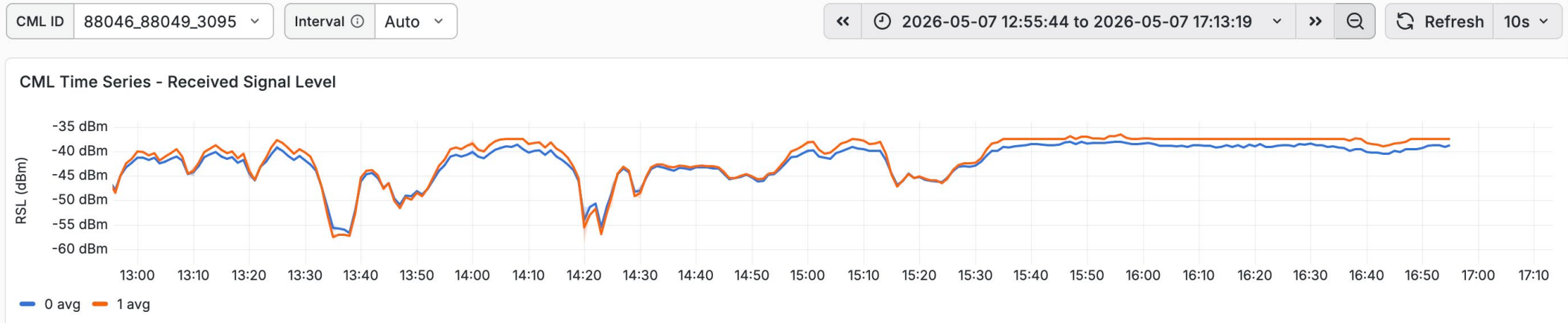
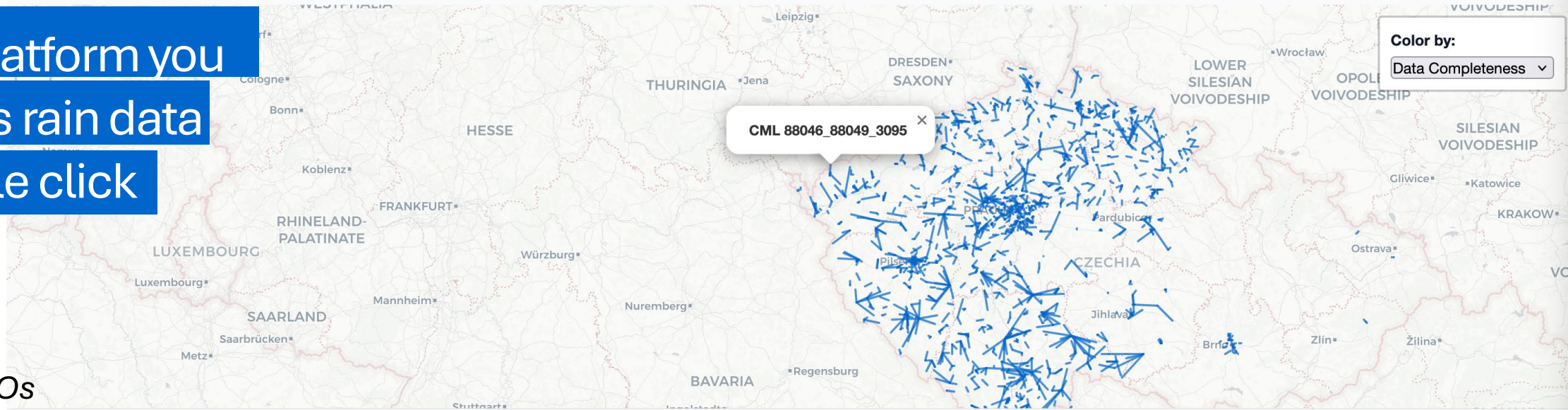


The data collection and processing (CAP) system -

provides a scalable central solution for handling CML data from a large number of data providers

With our platform you
can access rain data
with a single click

- eases data transfer from MNOs
- provides MNOs back weather-aware analytics
- Converts data to rainfall
- Provides rainfall to end users



Toward ITU report/recommendation

Radiocommunication Study Groups



Source: Document 5C/TEMP/135

**Annex 1.7 to
Document 5C/271-E
3 December 2025
English only**

Annex 1.7 to Working Party 5C Chair's Report

WORKING DOCUMENT TOWARDS PRELIMINARY DRAFT NEW REPORT
ITU-R F.[OPPORTUNISTIC_WEATHER_MONITORING]

**Fixed wireless link performance data collection for
opportunistic weather monitoring**

GMDI NEXT STEPS

- Founding GMDI as a legal entity with two branches:
 - Research & development holding data archive
 - Business providing data to paying customers and giving back part of the revenues to MNOs



- Continuity of data flows beyond SetGMDI
- Faster upscaling than universities allow
- Business-driven relationships with MNOs and end users

*Join us in converting
network signal
measurements into
public good*

Web: <https://gmdi.eu/>

Email info@gmdi.eu

Thank You