Response Summary of GPEX Community Survey on Precipitation Data

GPEX WG2
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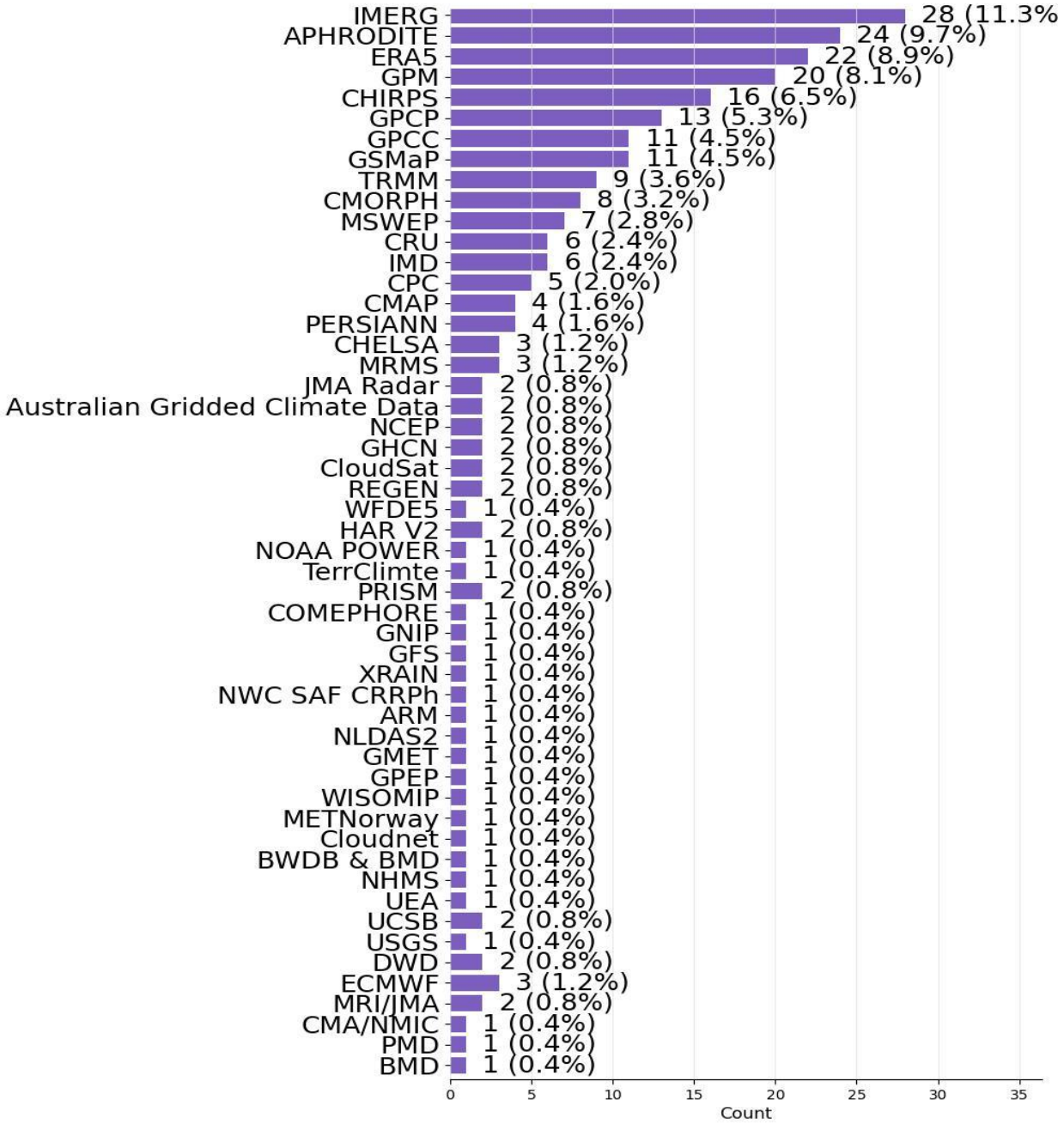
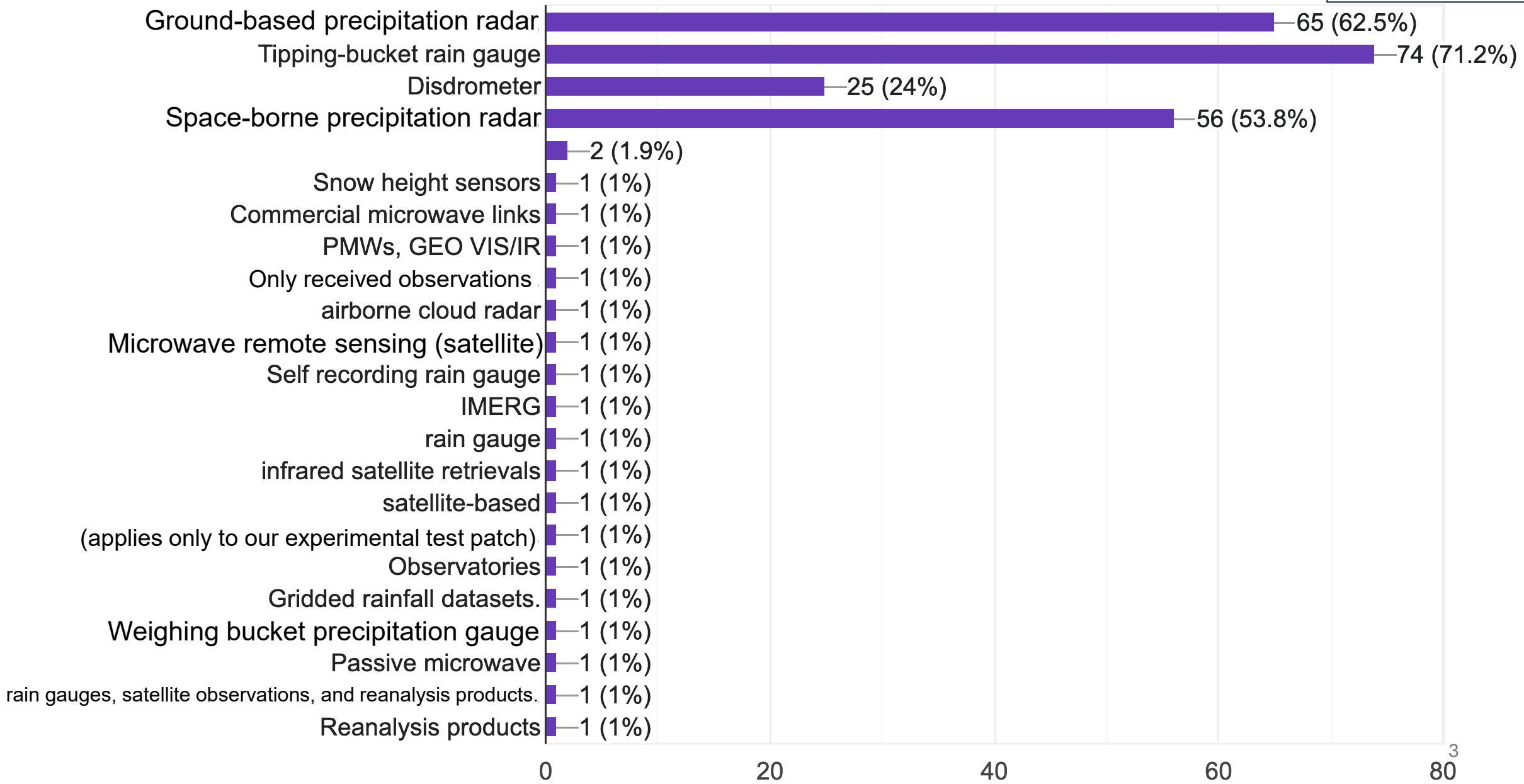
Which precipitation datasets do you use REGULARLY?



92 response

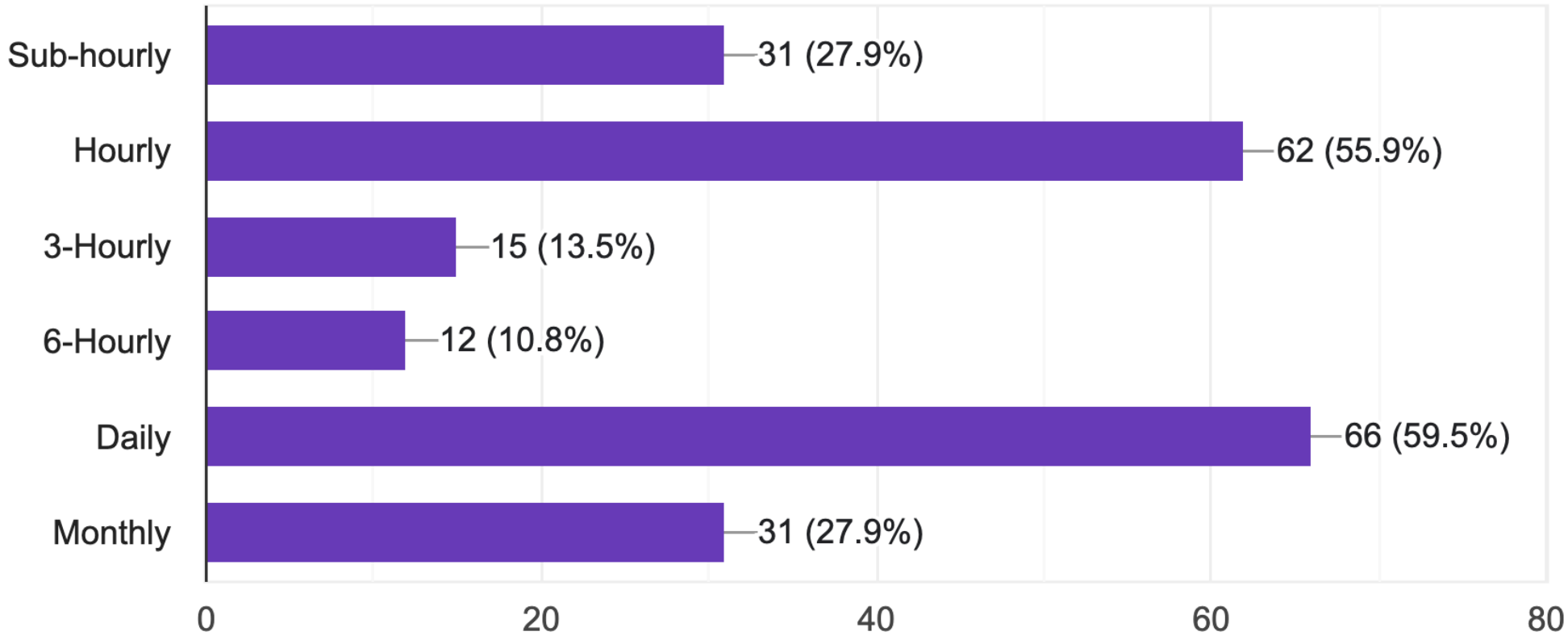
Which precipitation measurement instruments do you use?

104 response



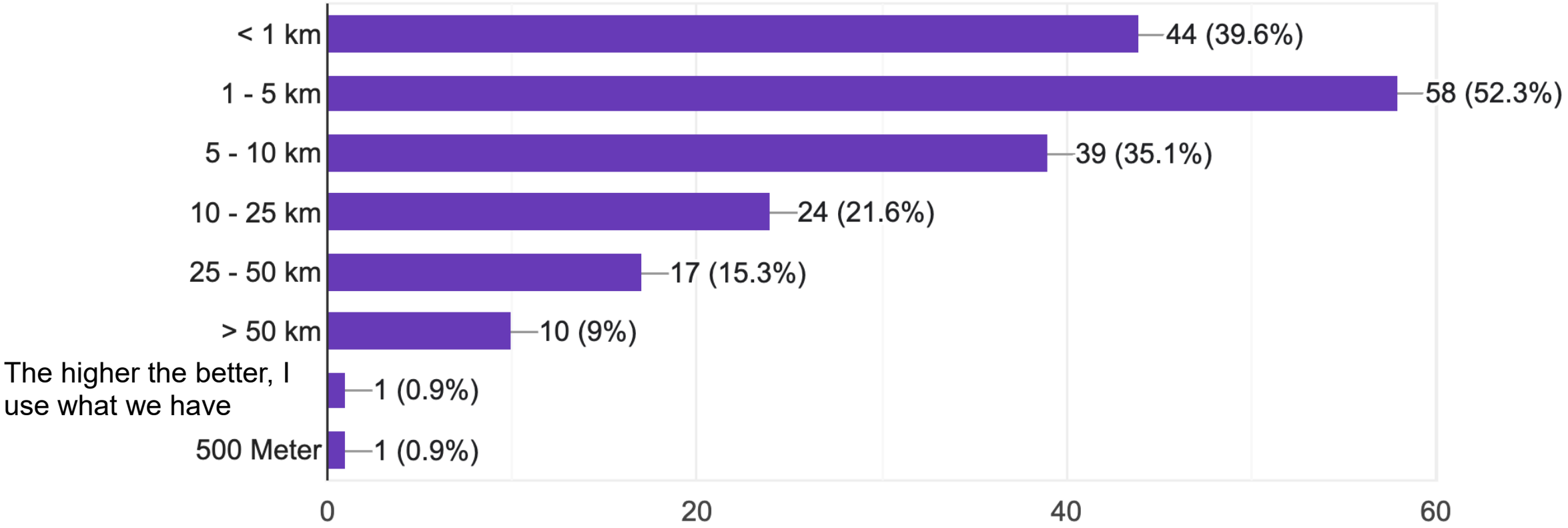
For your most critical application, what TEMPORAL resolution do you typically require?

111 response



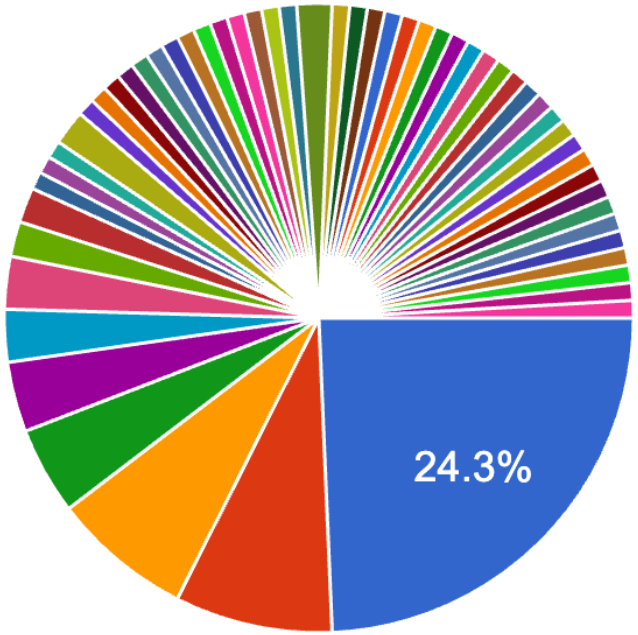
For your most critical application, what SPATIAL resolution do you typically require?

111 response



What is the primary geographic region of your focus?

111 response

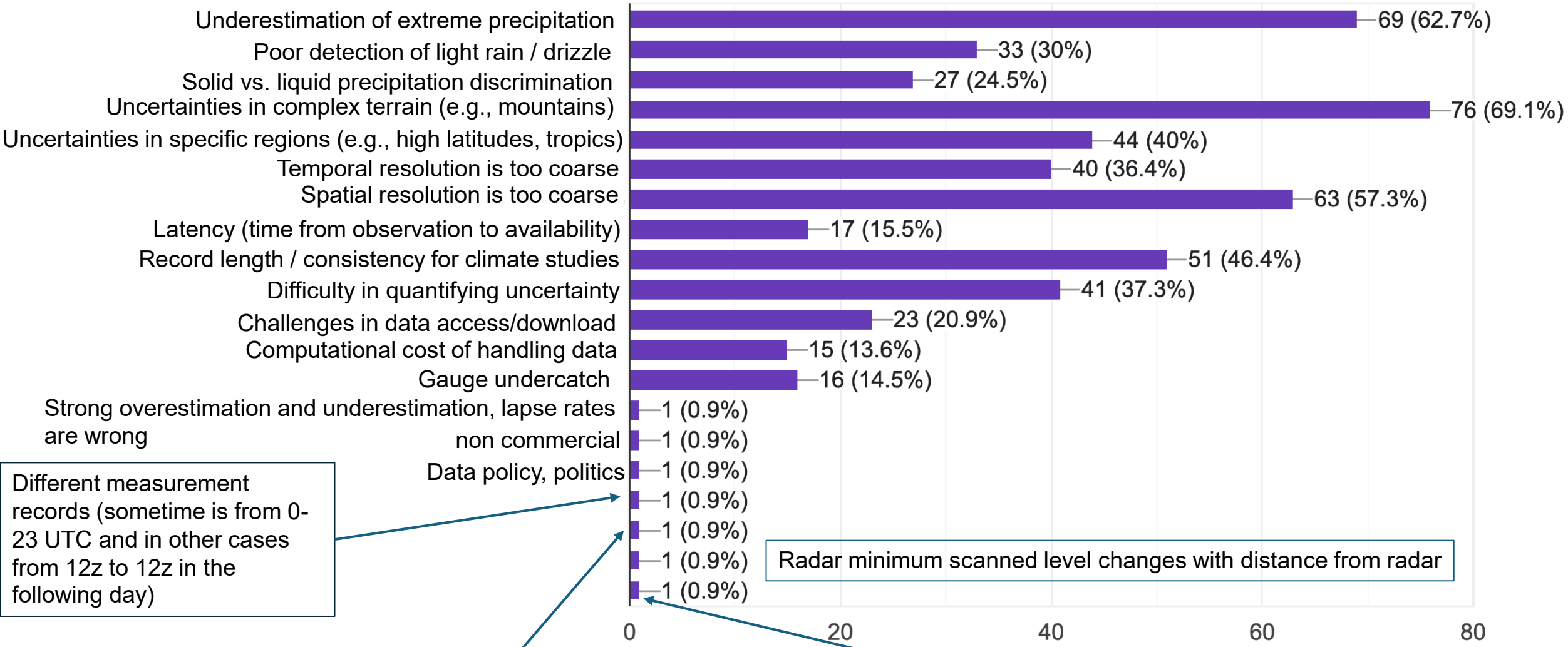


Global
South Asia
Southeast Asia
South America
Asia
India
Europe
Japan

1/7

What challenges do you encounter in your work?

110 response



Different measurement records (sometime is from 0-23 UTC and in other cases from 12z to 12z in the following day)

Radar minimum scanned level changes with distance from radar

challenges around extreme precipitation and precipitation in mountains

Improved forward modelling needed to use precipitation observations as radiances and reflectivity

What is the MOST IMPORTANT limitation in the precipitation data you use?

93 response

1. Underestimation of Extreme Precipitation
2. Insufficient Spatiotemporal Resolution
3. High Uncertainty in Data-Scarce Regions
4. Data Consistency, Record Length, and Latency
5. Challenges in Bias Correction and Uncertainty Quantification
6. Data Accessibility and Availability
7. Fundamental Accuracy and Physical Representation
    - Errors in Magnitude and Seasonality
    - Timing Errors
    - Sensor Differences
8. lack of in situ data
9. Forecast Limitations

In the data you use, are there specific precipitation processes or characteristics that are particularly poorly represented?

75 response

1. Tropical Cyclone rainfall (including extreme TC rain)
2. Cryosphere-related precipitation
3. Organization and structure of Mesoscale Convective Systems (MCS)
4. Ratio between stratiform and convective rain
5. Orographic precipitation (mountain amplification, elevation dependency, complex terrain effects)
6. Drizzle and light rain
7. Monsoon precipitation (including monsoon-related convective systems)
8. Cloudbursts and short-duration downpours
9. Sub-daily mesoscale processes
10. Local convergence zones
11. Precipitation phase (rain vs. snow, mixed-phase, transition regime)
12. Diurnal cycles of precipitation
13. Mountain amplification effects
14. Unknown mesoscale and large-scale patterns
15. Torrential rain and extreme heavy rainfall
16. High-altitude precipitation
17. Convective extremes (MCS cores)
18. Shear line precipitation
19. Transition zones between convective and stratiform regions
20. Localized convection and summer thunderstorms
21. Warm rain processes
22. Light snow
23. T-storms (Thunderstorms)
24. High-latitude precipitation (Arctic region, Cold Air Outbreaks)
25. Quantitative evaluation of snowfall in mountainous regions
26. Atmospheric rivers
27. Microscale to mesoscale convection
28. Coastal and oceanic precipitation
29. Urban area precipitation
30. Weak tropical convection
31. Precipitation processes around glaciers
32. Surface-coupled solid precipitation
33. Rain evaporation and precipitation efficiency
34. Precipitation variability within thermodynamically variable zones
35. Isotopic signature of precipitation
36. Polar snowfall
37. Modulation by climate patterns (e.g., ENSO) on seasonal and extreme rainfall

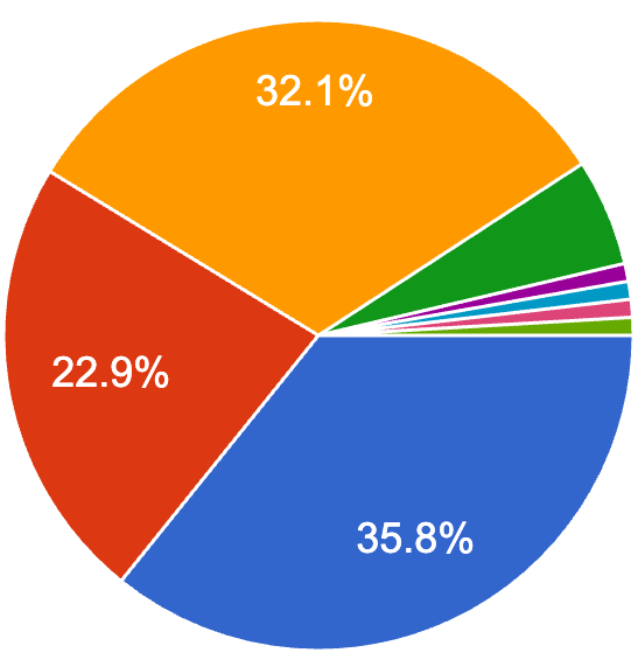
What are your TOP 3 priorities for improvement in future precipitation data products?

99 response

1. Lack of ground-based observations in remote and high-altitude regions
2. Gauge undercatch for solid precipitation (snow)
3. Sparse rain gauge networks in developing countries and mountainous areas
4. Limited radar coverage in complex terrain and oceanic regions
5. Satellite retrieval algorithm limitations for light rain and snow
6. Inadequate temporal resolution (daily vs. hourly/sub-hourly needs)
7. Insufficient spatial resolution for small catchments and urban areas
8. Short record lengths for climate trend analysis
9. Data latency and delayed availability for real-time applications
10. Inconsistencies between different data sources and sensors
11. Lack of uncertainty quantification in gridded products
12. Difficulties in bias correction without ground truth
13. Phase discrimination errors (rain vs. snow vs. mixed)
14. Underestimation of extreme precipitation intensity
15. Poor representation of convective processes
16. Terrain-induced precipitation biases
17. Limited validation data for extreme events
18. Inhomogeneities in long-term records due to instrument changes
19. Restricted access to high-resolution national data
20. Challenges in merging multi-sensor datasets
21. Computational burden for processing large datasets
22. Limited coverage of oceanic and polar regions
23. Difficulties in capturing diurnal cycles
24. Inadequate representation of orographic effects
25. Lack of standardized quality control procedures
26. Missing data gaps in time series
27. Scale mismatch between observations and model grids
28. Limited availability of sub-daily historical data
29. Challenges in quantifying precipitation efficiency
30. Insufficient characterization of precipitation microphysics

What analysis or benchmarking activity would be MOST VALUABLE to you?

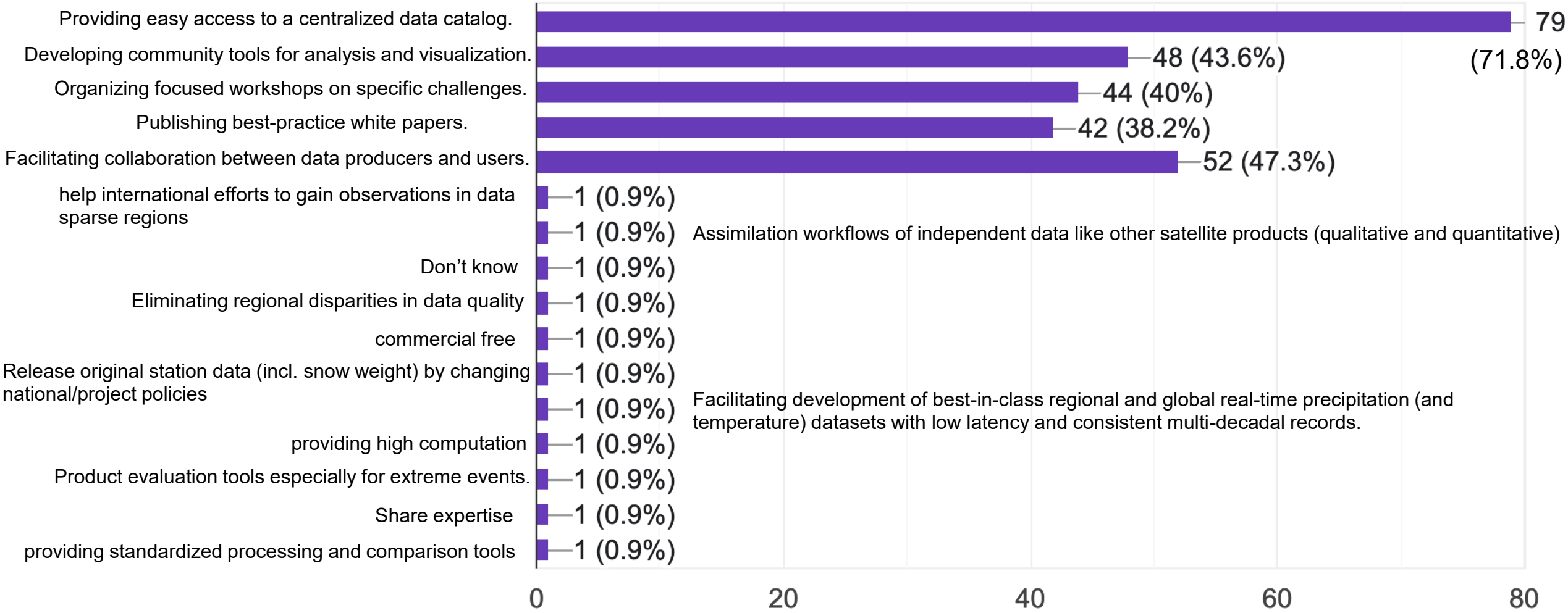
109 response



- Systematic intercomparison of major products (satellite, reanalysis, gauge).
- Focused evaluation over specific, challenging regions
- Development of a unified, high-quality global precipitation "reference" dataset.
- Community-driven protocols for uncertainty characterization.
- Mitigation of Data policy
- Applications in real time
- Extreme events
- also development of high quality reference

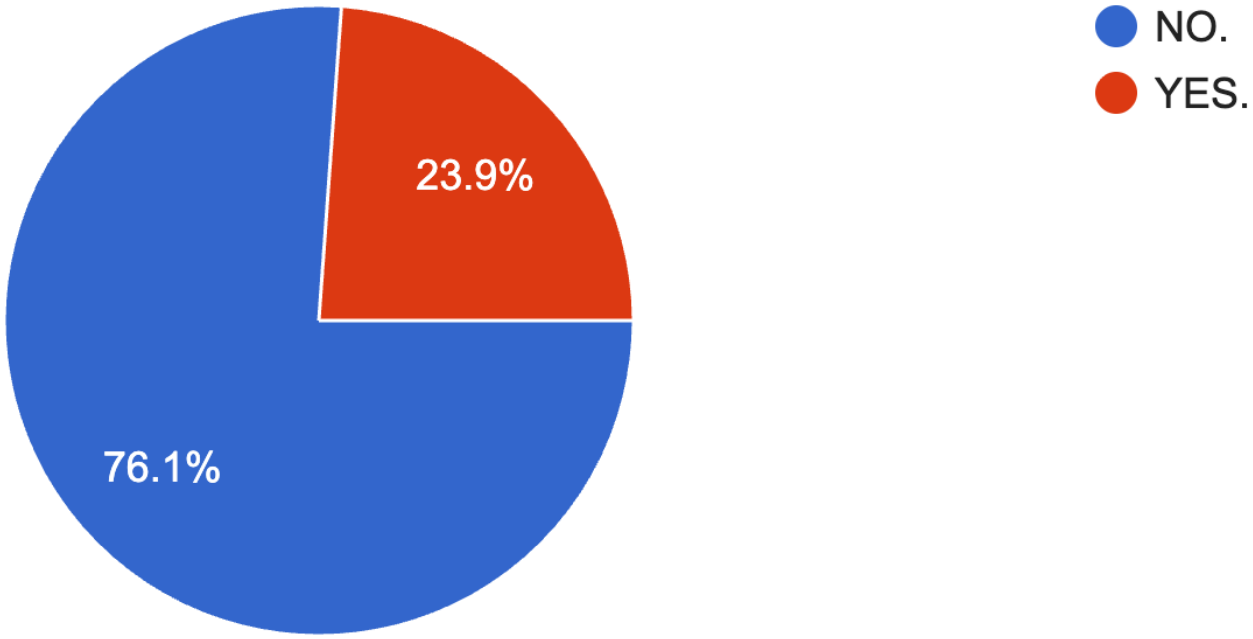
How could GPEX best support YOUR work?

110 response



Does your group/institution maintain specialized precipitation data not widely available?

109 response



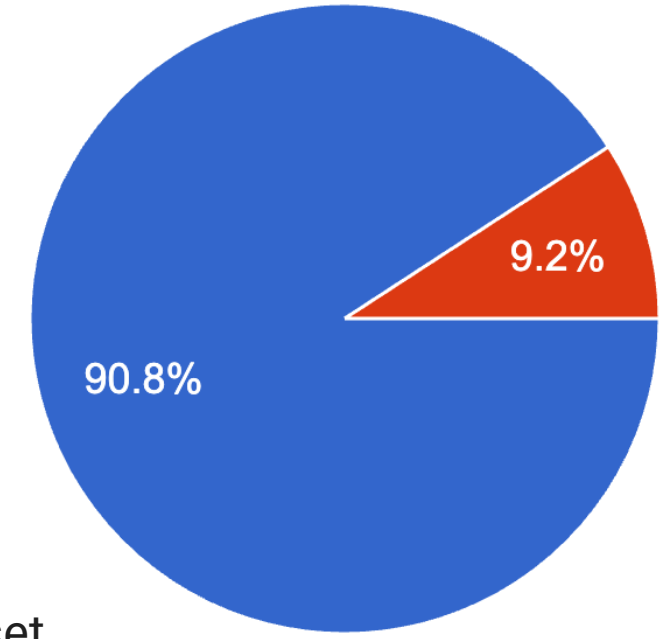
Detailed responses are in the next slide.

Please describe and indicate willingness to contribute to a GPEX community data pool. We will work with existing precipitation database organizers to archive your datasets.

17 response

1. BWDB rainfall dataset, Bangladesh, Daily, rainfall, Dr. Muhammad Masood
2. Dense gauge network (22 sites, 2km spacing), souther Germany, summer 2015 and 2016, rainfall depth, Christian Chwala (KIT)
3. We will provide observation data set to develop it and will Temporal Coverage it
4. Distrometer, Chia-Yi (Taiwan), 2023-2025 and beyond, Contact person: Chian-Yi Liu
5. Eastern Nepal Himalayas, Observations per event (1 hour or less), Precipitation, Hatsuki Fujinami
6. One new dataset my group recently released is the GPEP CONUS 0.02 degree multi-decadal ensemble daily precipitation and temperature dataset (https://gdex.ucar.edu/datasets/d953316/#). It does not need re-archiving as it is accessible through web services, and it is large (5.7Tb). It contains ensembles (20 member) and uncertainty statistics for daily precipitation and temperature mean and range, for CONUS, from 1950-2023. Andy Wood is the contact person.
7. MESONET, Mumbai, India, 15 minutes, Precipitation
8. Maria Laura Bettolli, South America, Daily, rainfall
9. I work on precipitation variability, extremes, and impacts over Northeast India and the Eastern Himalayan region, with a particular focus on orographic rainfall, mesoscale convection, and monsoon–terrain interactions.I am fully willing to contribute relevant datasets to the GPEX community data pool and to work closely with existing precipitation database organizers for proper archiving, documentation, and dissemination.
10. The GNIP database was designed to accept submissions; yet the process is not as easy institutionally as it could be technically
11. I don't have authority regarding this, but I think my institution would be interested in this. Contact Dr Sherdon Niño Uy
12. GLACIOCLIM, Nepal, 2012-present, precip+AWS, Fanny Brun
13. Pakistan, daily, temperature and precipitation, Dr. Ghazala
14. Analysis, data interpretation
15. Lyndon Mark P. Olaguera, 2012 onwards, AWS met variables. I think this one needs an MOU/MOA
16. Pakistan, South Asia, 1980-2025, Precipitation and Temeperature, Dr Akif Rahim
17. IAG/USP weather station, São Paulo, Brazil, hourly precipitation data since 1933 and 10 minutes precipitation data since 2007.
18. STORM-T/IAG/USP 2 X (single and dual) band weather radars, São Paulo, Brazil, since 2014, 1 S band (doppler, polarimetric) weather radar, São Paulo, Brazil, SPÁguas+FCTH/USP, since 2015

Do you have access to documentation for precipitation datasets that is not widely available but could be useful to others?



109 response

1. Yes I can share. BDWB rainfall dataset
2. We have serially complete daily station records associated with the GPEP conus dataset in the Zenodo repository entitled "Serially Complete Station Precipitation and Temperature Data for CONUS (1950-2023)" at https://zenodo.org/records/17932940. The publication for both gridded and station datasets is: https://www-sciencedirect-com.cuucar.idm.oclc.org/science/article/pii/S0022169425021018?dgcid=author#da005
3. "Bias correction and spatial enhancement of satellite-gauge precipitation for the Indus region", yes would love to share after final approval.
4. https://cdpc.pmd.gov.pk/home.htm
5. I will share letter

Is there any other information, expertise, or resource related to precipitation observations you would like to provide?

25 response

1. The work on the Global Microwave Link Data Collection Initiative (GMDI, see https://doi.org/10.1175/BAMS-D-24-0346.1) might be of interest for GPEX
2. DISDRODB: A Global Database of Disdrometer Stations (https://disdrodb.readthedocs.io/en/latest/)
3. GPM-API: Python software for download, access, analysis and visualization of > 100 GPM products (https://gpm-api.readthedocs.io/en/latest/)
4. RADAR-API: Python software for direct access to ground radar networks data available on cloud buckets (https://radar-api.readthedocs.io/en/latest/)
5. Can provide Precipitation data of my location based on traditional raingauge.
6. https://sites.google.com/view/hiprecs/homeenglish
7. I have experience analyzing satellite and gauge precipitation data, and visualization tools for hydrological applications. I can also contribute expertise in data quality control and local climate insights
8. We developed the Geospatial Probabilistic Estimation Package (GPEP) for producing such ensemble gridded forcings datasets. It's located here and contains a range of useful references and links: https://github.com/NCAR/GPEP/
9. For convection-permitting regional climate modelling, kilometric data is needed and up to now, only gauge-adjusted radar datasets are appropriate to evaluate these models. Unfortunately, they are not available in all countries (even when they have radar coverage) or for long periods of time. Over Europe, an interesting dataset would be EURADCLIm database (gauge-adjusted radar), but available only between 2013 and 2022 : https://dataplatform.knmi.nl/dataset/rad-opera-hourly-rainfall-accumulation-euradclim-2-0
10. My expertise is in understanding MCS precipitation processes, development of MCS tracking tools and datasets for benchmarking Earth System Models
11. We host [an ever evolving] validation tool for satellite-based precipitation products, using the MRMS as a reference. Archived and near-real time assessments are publicly available at https://precip-val.umd.edu/
12. I have expertise in satellite-based precipitation retrievals, gauge satellite data fusion, and machine learning approaches for precipitation estimation and downscaling. I also have experience with remote sensing integration, high resolution climate data analysis, and validation in complex terrain and data sparse regions. I am willing to contribute knowledge, analysis scripts, and local area insights to support WG2 activities, including intercomparison studies, uncertainty quantification, and region specific evaluations.
13. The resolution of datasets gets distorted during regrding process during evaluation efforts against other precipitation datasets and even climate models, while the climate models still maintain good amount of actual data during this process.
14. From WG1 to WG2: Harald, should we have a cross-WG isotope discussion? Not sure who else is "isotopically enabled" in the other WGs.
15. Only the ones that I mentioned and are public here: https://glacioclim.osug.fr/Donnees-du-Nepal-region-du-Khumbu
16. Automatic Weather Station data outreach
17. Yes, please see, https://doi.org/10.1175/BAMS-D-24-0226.1
18. Expertise in extremes and indices, data rescue and acquisition, dataset intercomparison and links to international working groups (e.g. WMO)
19. the optical disdrometer instrument I developed is open source: https://doi.org/10/gt2mpx https://doi.org/10/g89qq7
20. I mainly use APHRODITE, ERA5, and satellite precipitation products. I also find that combining multiple datasets helps reduce biases and better capture extreme events.
21. I have multiple data analysis with respect to ground observational data.
22. I have tested most of the datasets for my study area which is of mountain terrain, it is very rare that most of the datasets have capture extreme precipitation case which hinder in capturing high peak discharge in hydrological modelling.
23. Probabilistic precipitation predictions over High Mountain Asia
24. High-resolution precipitation assimilation in numerical simulations of atmospheric and land-surface processes.
25. Need training on precipitation data downloading and analysis using python