M.Sc thesis topic 2021-2022

DISDRONET: *the first global, open, homogeneous database of rain drop size distributions*

Description:
Raindrop size distributions (DSDs) describe the number and size distributions of raindrops. They are essential for understanding rainfall microphysics and the interaction of rainfall with the surfaces it impacts (e.g., vegetation, buildings, soils, ..). DSDs are also required to interpret remotely sensed precipitation data from ground-based or spaceborne radars, radiometers or telecommunication links as well as to improve rainfall forecasts in numerical weather models.

Challenge:
Around the globe, sensors called disdrometers are used to collect information on DSDs. Hundreds of measurement campaigns have been performed by the NASA Precipitation Measurement Mission Science Team, meteorological services, and universities. However, only a small fraction of these data are findable, accessible, interoperable and re-usable. Data are stored in disparate formats with poor documentation.

Goal: the project has two primary objectives:
1) build a global database of well-maintained, homogenized disdrometer data.
2) analyze and compare DSD data across the globe to better understand natural variability and document differences across instrument types, scales and climatic regions.

Outcome:
The database, metadata and results from the preliminary analyses will be described in a report with the goal to publish them in an open-access journal such as Earth System Science Data. Also, an online platform on GitHub where researchers can share their experiences, codes, and best practices related to the measurement and modelling of DSDs will be created.

Work plan:
1. Birth of DISDRONET: an initial DSD database will be created based on the input of our partners at EPFL Lausanne (Switzerland), UNSW Sydney (Australia) and NASA PMM/GPM team.
2. Meta-data format. In consultation with international partners, you will define the common data format and associated metadata to be used within DISDRONET. You will also write scripts for converting data to the desired format.
3. Expansion of DISDRONET. You will browse the literature for potential DSD datasets and reach out to as many authors as possible, requesting access to their data and permission to share them.
4. Quantitative analysis: crucial aspects of the DSD such as the median drop diameter, number concentration and temporal variability will be analyzed to document differences across scales, types of disdrometers and climatic regions.

Collaboration: You will work with an international team of DSD experts at EPFL Lausanne (Switzerland), UNSW Sydney (Australia) and members of the NASA PMM / GPM International Collaborator Team.

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