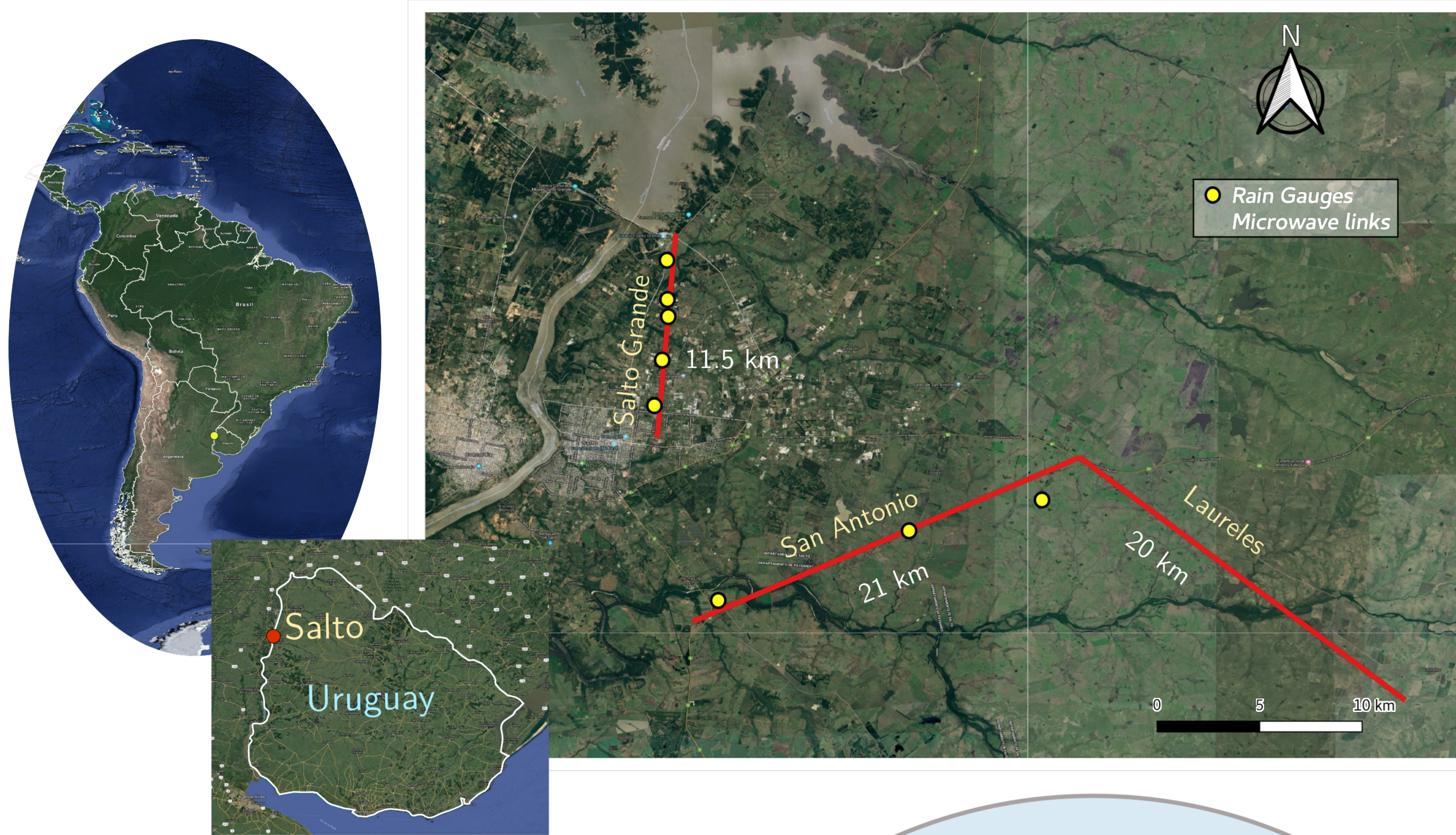


Rainfall estimation by microwave links in Uruguay: First results

Area of Study



Uruguay has a temperate and humid climate (1400 mm / year) (Cfa), with a great spatial and temporal variability in precipitation. Rainfall is measured by conventional (daily data) and automatic (15 minutes) rain gauges by several institutions. 50 km average distance between stations. There are no radars. The Argentine radar of Ezeiza reaches small area. Satellite precipitation has large errors in the estimation of rainfall, they need to be combined with other measurement techniques.



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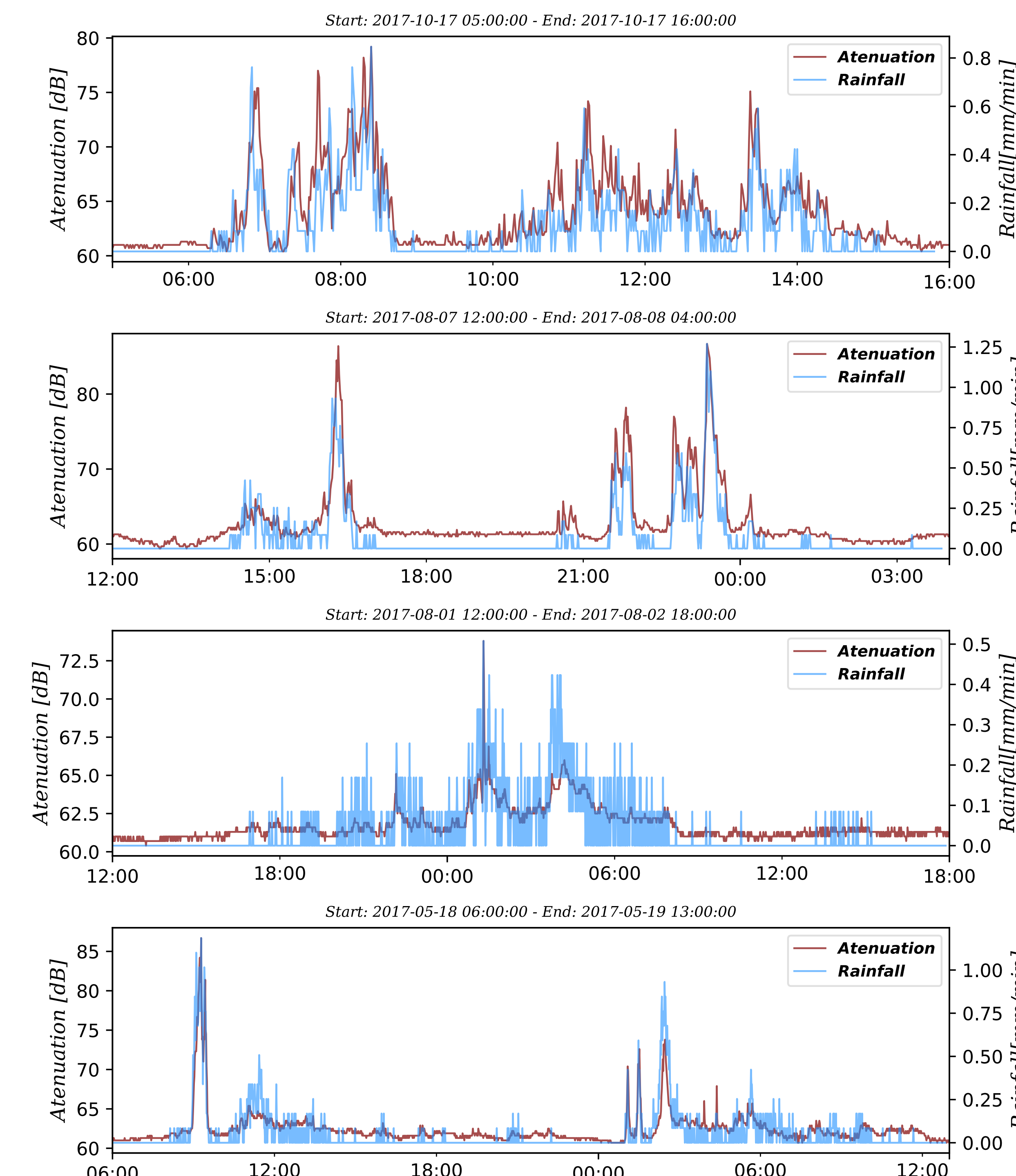
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Experiment

- **3 microwave links, 7 GHz**, 1 + 1, sampling TX near, TX far, RX near, RX far, every **1 minute**. TX = power transmitted [dB]
RX = power received [dB]
- **8 tipping-bucket rain gauge**, resolution **0.25 mm/tip, 1 minute**
- **1 meteorological** station 1 minute, temp, relative humidity, atmospheric pressure, wind velocity
- **2017-2018** period of analysis
- **44** precipitation events selected:
33 calibration, **11** evaluation.

Observed Events



Model

$$A_{tot} = TX_{far} - RX_{near}$$

$$S_{W_t} \leq 0.2 \quad t = Dry \quad A_{clear} = \bar{A}_{W_t}$$

$$S_{W_t} > 0.2 \quad t = Rain \quad A_{clear} = A_{clear}(t - i)$$

$$\text{rolling mean} \quad \bar{A}_{W_t} = \frac{1}{N_W} \sum_{t \in W_t} A_{tot}(t)$$

$$\text{rolling std} \quad S_{W_t} = \left[\frac{1}{N_W} \sum_{t \in W_t} (A_{tot}(t) - \bar{A}_{W_t})^2 \right]^{1/2}$$

$$i = \min(t - i \in Dry)$$

$$A_{tot}(t) = A_{clear}(t) + A_{rain}(t) + A_{wet}(t) + A_{vap}(t) + q(t) + n(t)$$

$$A_{rain} = A_{tot} - A_{clear}$$

$$R = a(A_{rain}/L)^b$$

a b estimated by Weighted Linear Regression in log scale.

weights estimated as inverse square distance to the median

Results

