Uncertainty Quantification of Precipitation Measurement with Weather Radar

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Context

- **Flash flood:** a major natural disaster in several urban areas.

  In Brazil, more than 27% of Brazilian cities were affected by extreme events.

- **Monitoring and forecasting:** main source of uncertainty coming from input data (forecast and observed real time precipitation).

Rain gauge

Radar

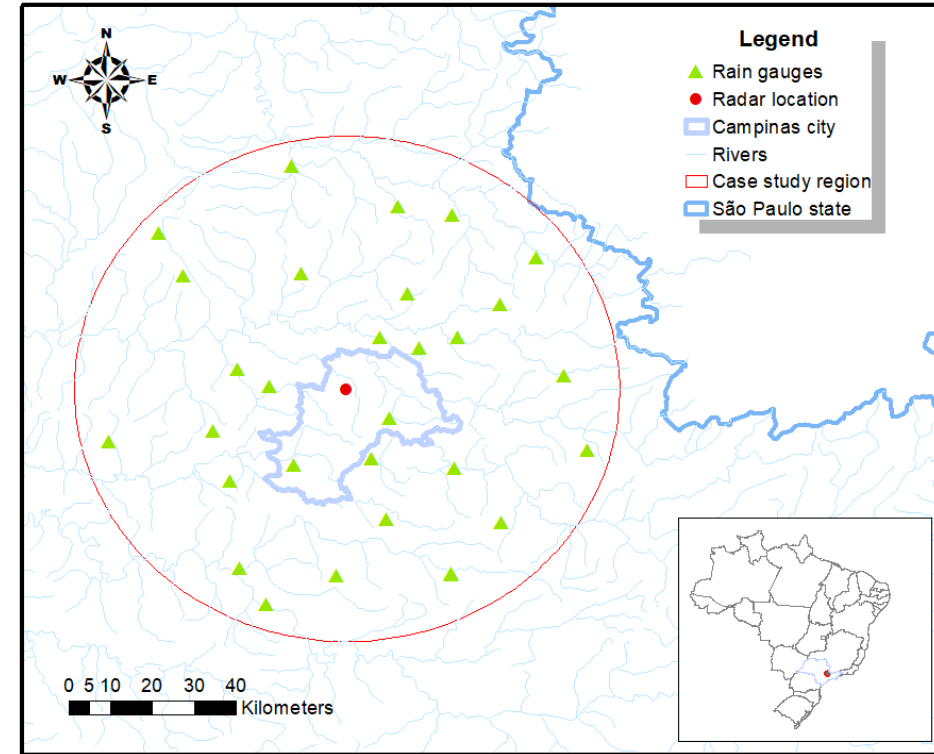What is the real rain**?**

Study area and main data

Study area:

- Region: Campinas city – São Paulo state, Brazil (60 km2 of radar)

Data:

- 30 rain gauges
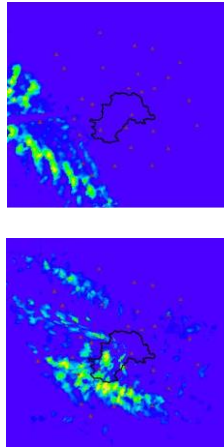- Radar 60 min, 200 m^2

For more details Caseri et al. 2020

The chosen area of study has gone through several extreme events.

Method
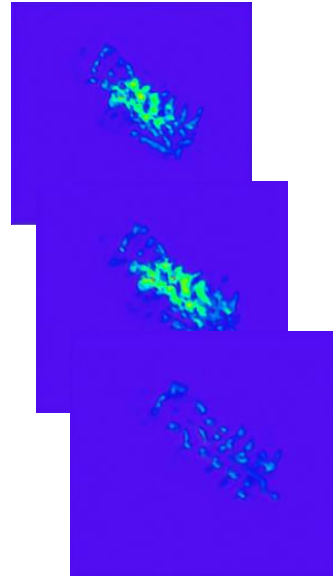

KED

Kriging with **external drift**
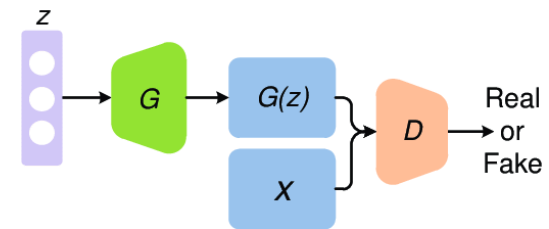
Kriging Maps

Taking into account the uncertainty

SinGAN

Generative Model from a Single Natural Image
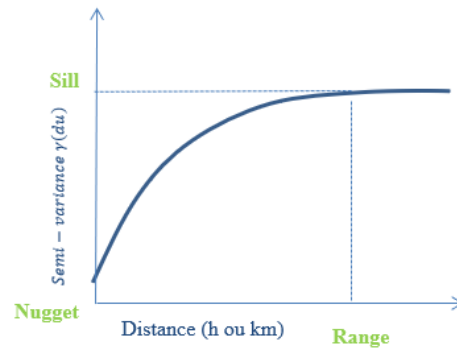
Ensemble

N members

Rain gauge: Primary

Radar: Secondary

Variogram

Spherical model

Pyramid convolutional GANs

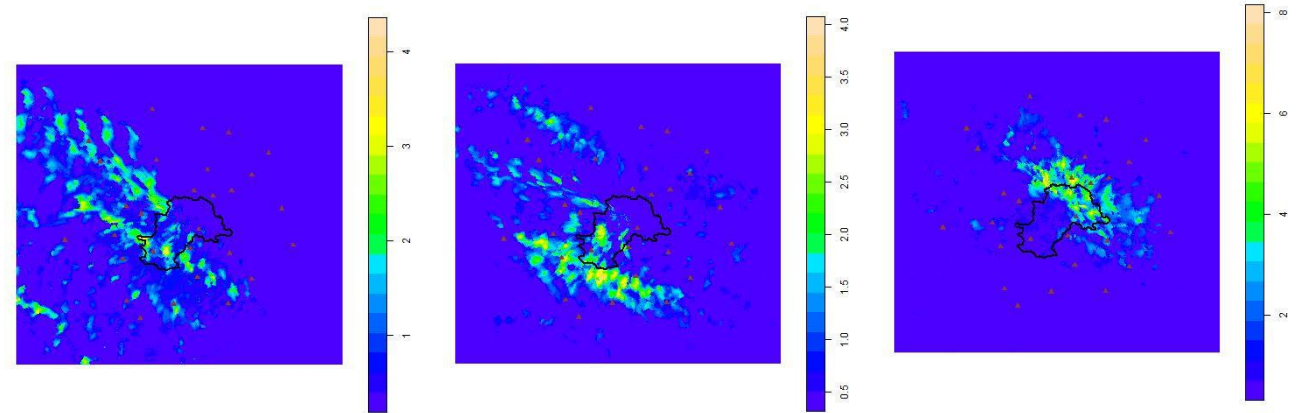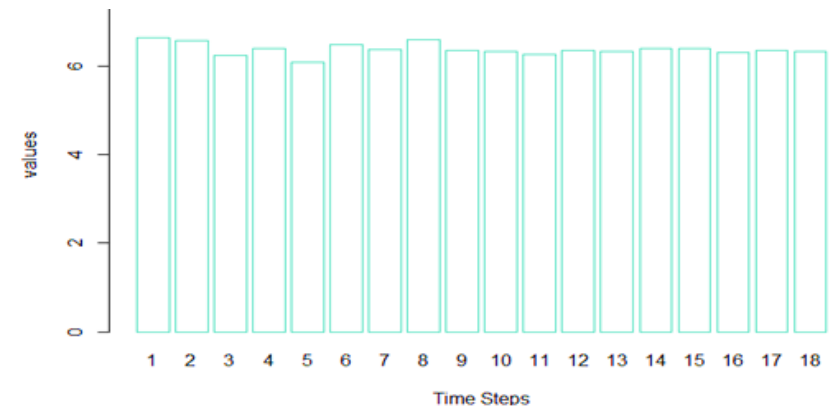Source Image: Pan et al., 2019

Results

Eve 2017/04/26
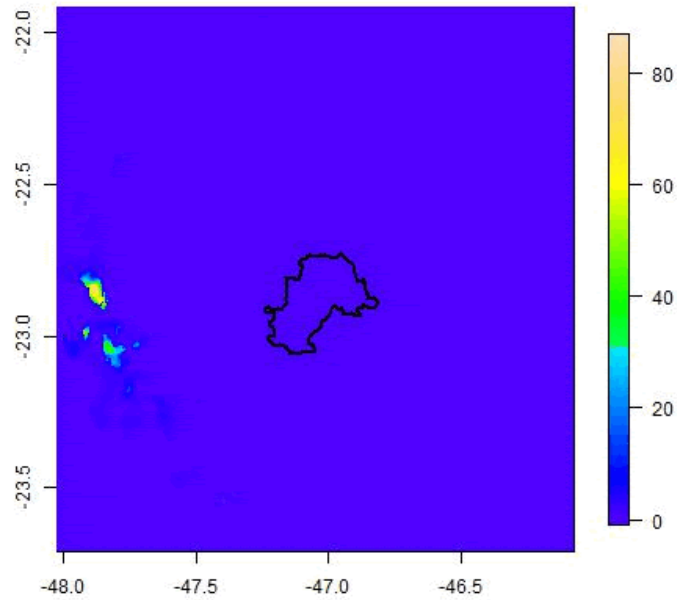
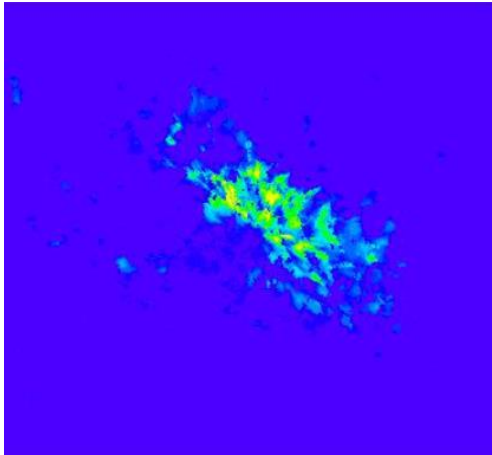## Kriging with External Drift (KED)

Validation (MAE)
KED vs Rain Gauge

Results

KED Image

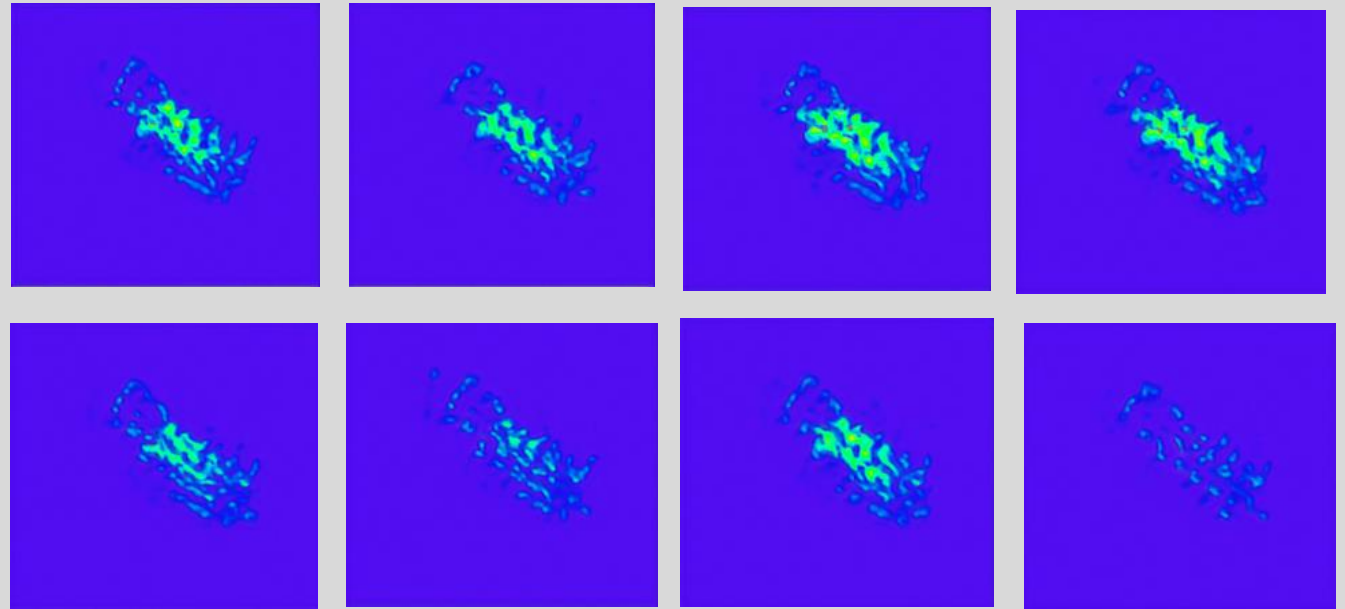*Generate Ensemble for each rainfall image*

SinGAN
Generative Model from a Single Natural Image
Shaham et al. 2019

10 members

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Conclusion and Perspectives

Conclusion

- This method can be a solution to quantify the uncertainties of rainfall data by combining radar and rain gauge measurements.

- The data generated makes it possible to improve the spatial estimation of precipitation and the location of extreme rainfall events, such as storms.

Perspectives

- Apply the methodology to other extreme events in the region.

- Compare the method with other techniques for generating probabilistic maps.

- Validate the method considering accuracy metrics, in addition to visual validation

Thank you for your attention

Questions?

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References

- Caseri,A., Angelis,C.F., Sperling, V.B., Leblois, E. 2020. Statistical Variability of Severe Rainfall Events in Southeastern Brazil, Anuário do Instituto de Geociências, DOI: 10.11137/2020_4_470_478

- Shaham, T.R., Dekel, T., Michaeli, T. 2019. SinGAN: Learning a Generative Model from a Single Natural Image, Computer Vision and Pattern Recognition, DOI: 10.48550/arXiv.1905.0116

- Z. Pan, W. Yu, X. Yi, A. Khan, F. Yuan and Y. Zheng, "Recent Progress on Generative Adversarial Networks (GANs): A Survey," in IEEE Access, vol. 7,DOI: 10.1109/ACCESS.2019.2905015.