# The Climate Corporation Field Experiments of Sub-Field Variability of Precipitation and Wind

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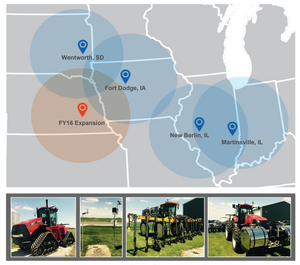
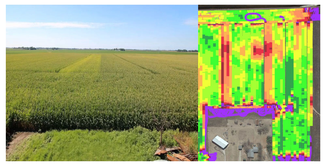
## TCC tests our advice on real farms

TCC provides agronomically-relevant, field-specific weather information to growers (over 75 million acres in 2015).




Our research farm locations



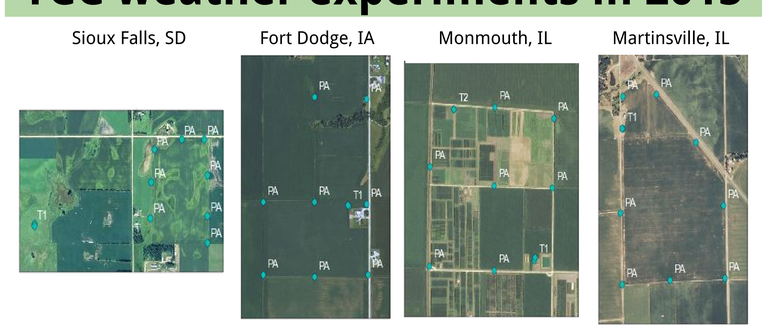
Fertility strip trials and associated yield map

Crop health/damage

Field Workability

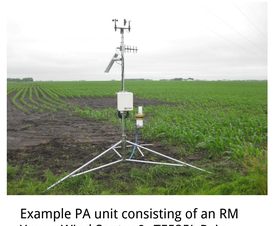
## TCC weather experiments in 2015

Sioux Falls, SD | Fort Dodge, IA | Monmouth, IL | Martinsville, IL




### Sub-Field Variability

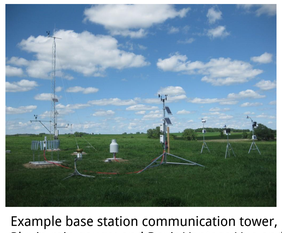
Sensors to measure precipitation and wind surrounding a field. (~8 per CRF)



Example PA unit consisting of an RM Young Wind Sentry & TE525L Rain Gauge in a corn field.

### Interstation Comparison

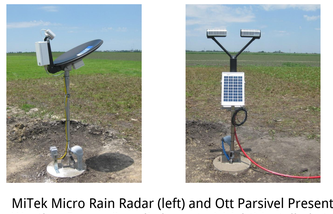
Cluster of instruments at each location to evaluate performance.



Example base station communication tower, Pluvio rain gauge; and Davis Vantage Vue and Vantage Pro2 and Spectrum Watchdog weather stations. In addition, included a rain gauge with and without a windscreen.

### Remotely-Sensed Precipitation

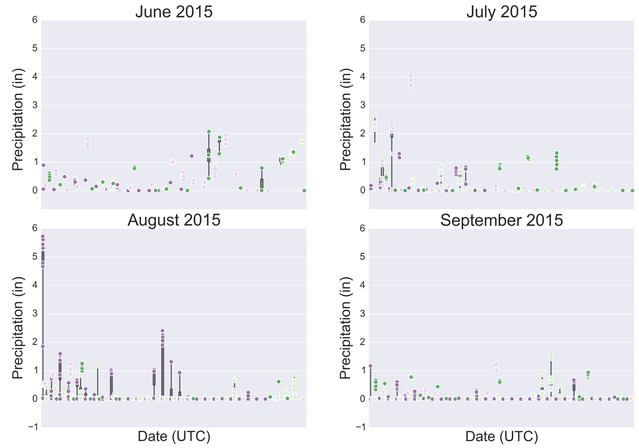
Micro Rain Radar and disdrometer to measure DSD, rain rates, liquid water content, reflectivity, velocities, and present weather. Data can be used to compare TCC models of precipitation.



MiTek Micro Rain Radar (left) and Ott Parsivel Present Weather Sensor (i.e., disdrometer) (right) installed at Monmouth, IL.

## Within a field, rainfall can vary by 65%

**Observed Rain Gauge Variability:** Hourly precipitation data by hydrologic day, June - September 2015. Variability is natural and weather-related.[1]



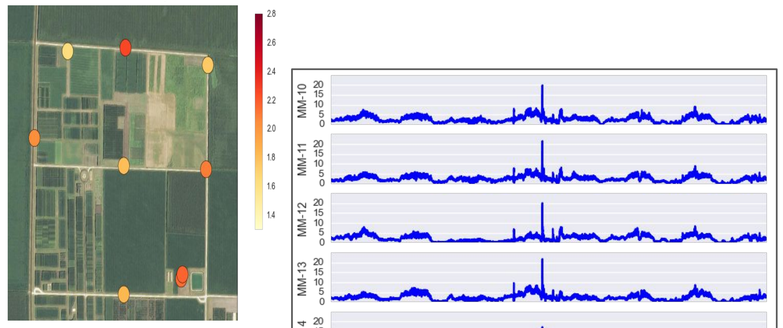

### Modeled Rain Gauge Spatial Variability

A simple linear model, suggests that gauge variability within a field is about 65% of the intensity, but fails to account for high variability events and overestimates low-variability events.[1]


## Intra-field variability in wind

**Wind Speed Variability:** Average hourly wind speed, June-September 2015 show intra-field variability.[3]

Monmouth, IL




Fort Dodge, IA

## TCC's QPE is more accurate than others

**Quantitative Precipitation Estimates (QPE):** Daily QPE at CRF locations for June - August 2015.[2]

1.) Rain/No Rain Events

| | CSI | POD | FAR |
|---|---|---|---|
| TCC | 0.84 | 0.93 | 0.11 |
| A | 0.78 | 0.99 | 0.21 |
| B | 0.82 | 0.97 | 0.16 |

2.) Workable Days

| | CSI | POD | FAR |
|---|---|---|---|
| TCC | 0.77 | 0.85 | 0.12 |
| A | 0.71 | 0.89 | 0.23 |
| B | 0.73 | 0.89 | 0.20 |

3.) Errors

| | Within 0.1" | Bias (mm) | MAE (mm) |
|---|---|---|---|
| TCC | 64% | 0.50 | 2.73 |
| A | 58% | 2.21 | 4.20 |
| B | 55% | 0.99 | 3.39 |

## Future Work

- Evaluate 2-m wind data for farming decisions
- Improve QPE algorithms using MRR and disdrometer data
- Study sensitivity of agronomic advisors to weather
- Install a TCC Weather Station Network

## References & Acknowledgements

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1. Valliappa, Lakshmanan and Pasch, Adam. Evaluation of CRF Rain Gauge Data. The Climate Corporation, December 2015.
2. Nick Carr, Lakshmanan, Valliappa and Alvarez, Francisco. Evaluation of Precipitation Products. Technical Report, The Climate Corporation, November 2015.
3. Dail, Holly and Massey, Jeff. Evaluation of CRF Wind Data. The Climate Corporation, December 2015.

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