Process-based Crop Simulations

- 0.5° global simulations
- 756 input combinations
- daily iteration
- 4 staple crops

pDSSAT | LPJmL | LPJ-GUESS | PROMET | PEPIC | EPIC-TAMU | GEPIC | CARAIB | JULES

810 PPM
660 PPM
510 PPM
360 PPM

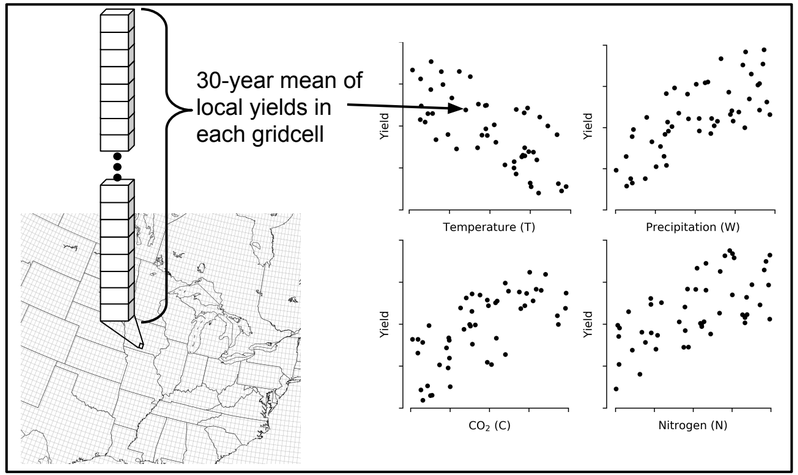
W + 30%
W + 20%
W + 10%
W
W - 10%
W - 20%
W - 30%
W - 50%

30 years / model / crop

T - 1K | T | T + 1K | T + 2K | T + 3K | T + 4K | T + 6K

x 3 levels of nitrogen and x 2 growing season specs.

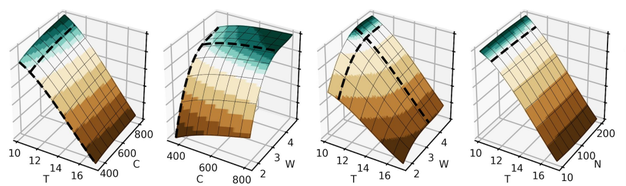
Temporal Aggregation



Polynomial Emulation

Local (i,j) mean yields are related to local mean weather (T, W), local nitrogen application (N), and global CO_2 (C) with a third order polynomial with interaction terms:

$$\hat{Y}_{i,j} = \alpha_{i,j} + \sum_{n=1}^{3} \beta_{1n(i,j)} C^n + \beta_{2n(i,j)} T_{i,j}^n + \beta_{3n(i,j)} W_{i,j}^n + \beta_{4n(i,j)} N_{i,j}^n + \beta_{5n(i,j)} C^n \cdot T_{i,j}^n + \ldots$$



4-D parametric response surface in each gricell for each crop / model