RESEARCH DIRECTIONS AND COLLABORATIVE OPPORTUNITIES USING A NEWLY ESTABLISHED HONEY BEE APIARY IN THE SANTA RITA EXPERIMENTAL RANGE

William G. Meikle and Milagra Weiss

Carl Hayden Bee Research Center
Tucson, AZ
Outline

- Summary of what continuous data show us
- Exploring weight and temperature data from our apiaries
- Overwintering experiment at SRER
- Pesticide exposure experiment at SRER
Continuous weight data shows changes in:

- **Forager activity** from changes in the amplitude of the hourly detrended weight;
- **Colony population growth and foraging success** by comparing changes in daily weight variability with changes in running average weight;
- **Swarming** shown as a spike in detrended weight, followed by sharp decrease;
- **Colony decline** from decreases in both average and detrended weights.

References:

- **Buchmann S.L., Thoenes S.C. 1990.** The electronic scale honey bee colony as a management and research tool, Bee Sci. 1:40–47.
- **Hambleton J.I. 1925.** The effect of weather upon the change in weight of a colony of bees during the honey flow, USDA Dept. Bull. No. 1339.
Arizona apiaries:

Carl Hayden Bee Research Center
Tucson, AZ

Santa Rita Experimental Range
near Green Valley, AZ
Continuous weight data from hives at SRER

- Fed sugar syrup
- Box added
- Box removed
- Box added
- Honey harvested
- Queenless colony declines

Overwintering experiment: Manipulation of pollen stores
A 15-day sample of **Raw data**.

The 25-hour running average for the same data sample.

The **detrended data** for that sample, calculated simply by subtracting the running average from the raw data.
Allocating hive weight among bees, brood and food resources

**Adult bee mass:** weigh the hive and then the parts after shaking them free of bees. Divide by average adult bee weight to get bee population size.

**Brood mass:** weigh frames and then analyze photos to determine brood density and proportion of frames covered by brood.

**Food mass:** same as for brood mass
Monitoring temperature & humidity:

Temperature and humidity sensor with integrated data logger

Data logger with attached temperature sensor cable

Temperature sensors and data logger for monitoring conditions.
**Detrended weight amplitude** is related to the adult bee population and **detrended weight amplitude** is related to brood mass.

Each point is the average of 3-4 hives at a given sampling occasion at one of 2 locations. Adjusted $r^2 = 0.81$ for weight and 0.95 for temperature.
Overwintering: Manipulating the locations of pollen stores in collaboration with the Kirk Anderson lab
Pesticide effects on the colony growth and activity in collaboration with the Mark Carroll lab
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