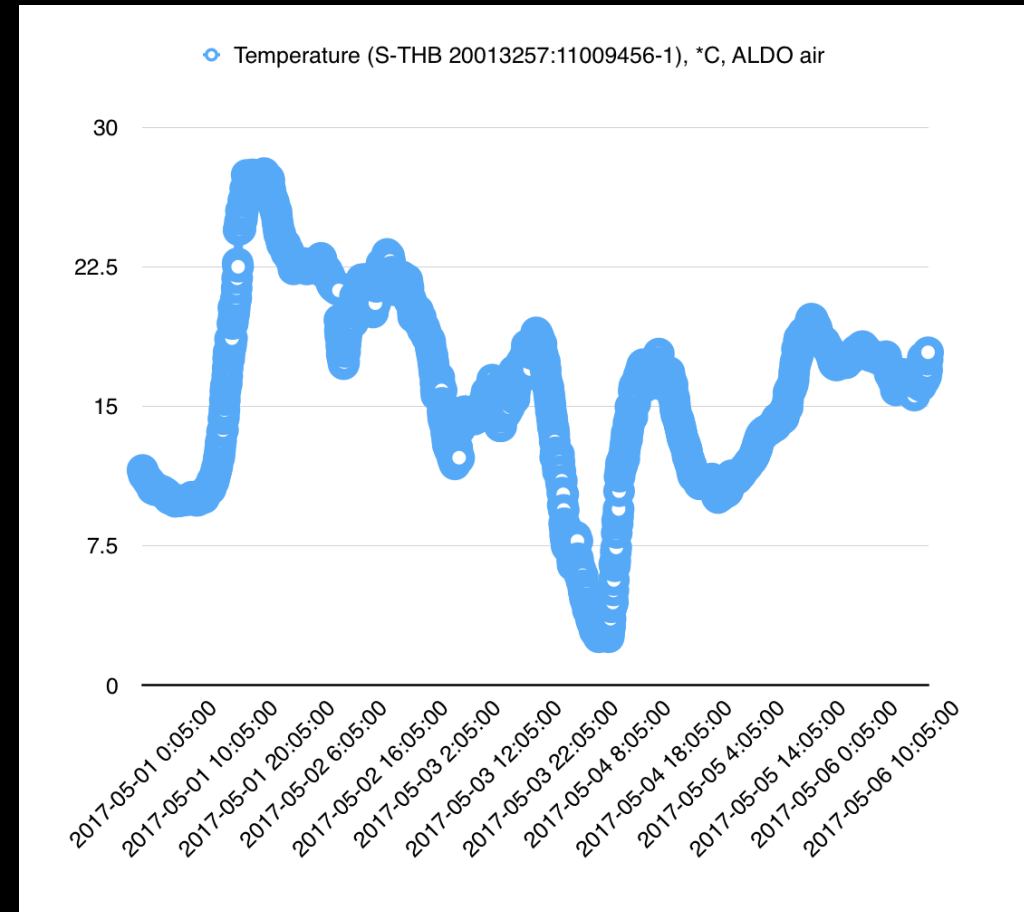


# What sorts of data are being generated?



# What sorts of data are being generated?

- *Abiotic* data about environmental conditions
  - Weather related data
    - At the right is a graph depicting the change in air temperature over the first week in May 2017
    - Notice that the readings are in great multitude (all scrunched up)
      - This is because readings are made every five minutes



# What sorts of data are being generated?

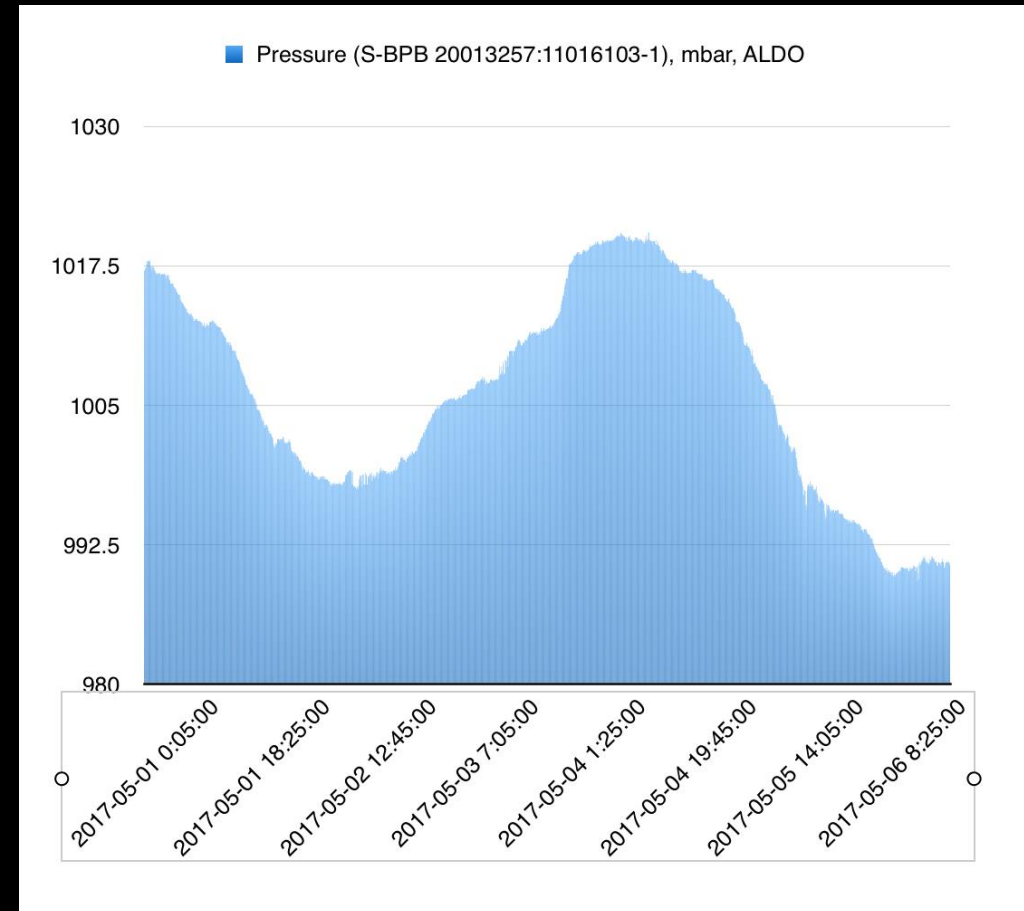
- *Biotic* data about the Monarchs
  - Birth rate and development
    - Egg, larva, pupa, adult
  - Death rate
    - Killed by predator or parasite
    - Natural causes
  - Not yet completely defined

Larva – *Instars 1-5*



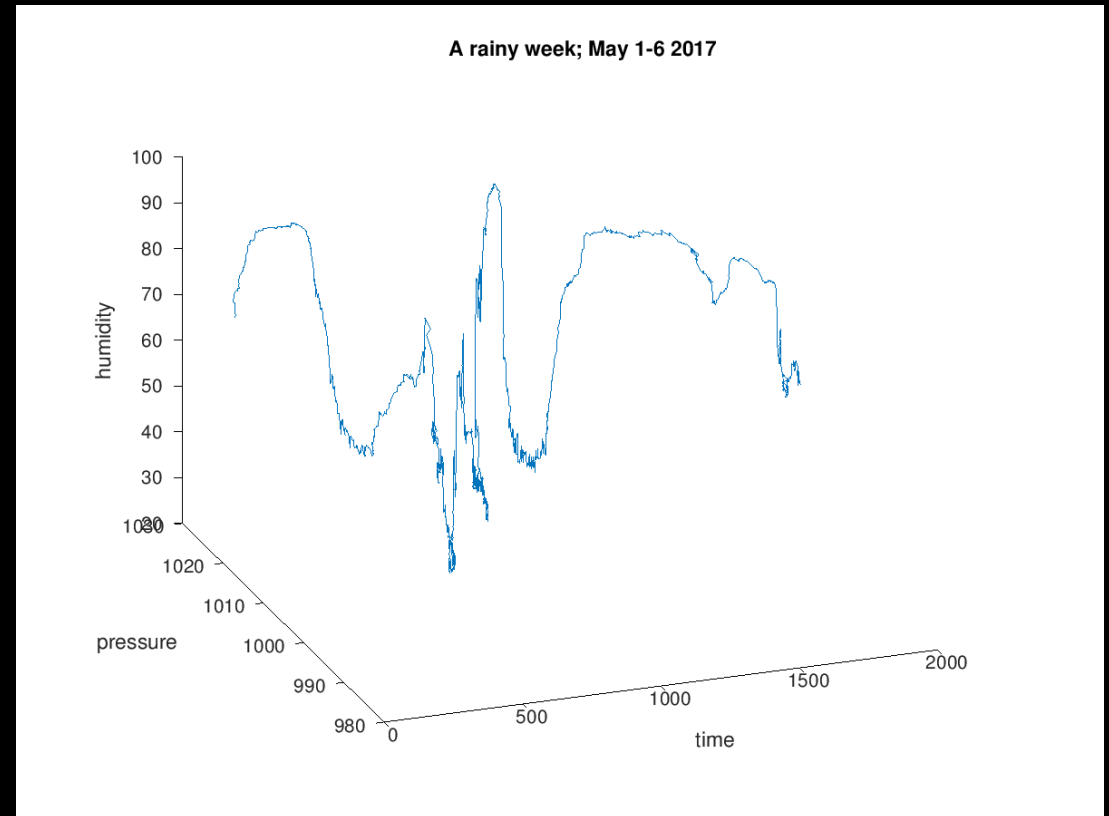
# Common Threads

- What does data about the environment tell us about the environment?
  - Perhaps more importantly, what does this data tell us about trends in biotic factors?
    - Which resources might guide us?



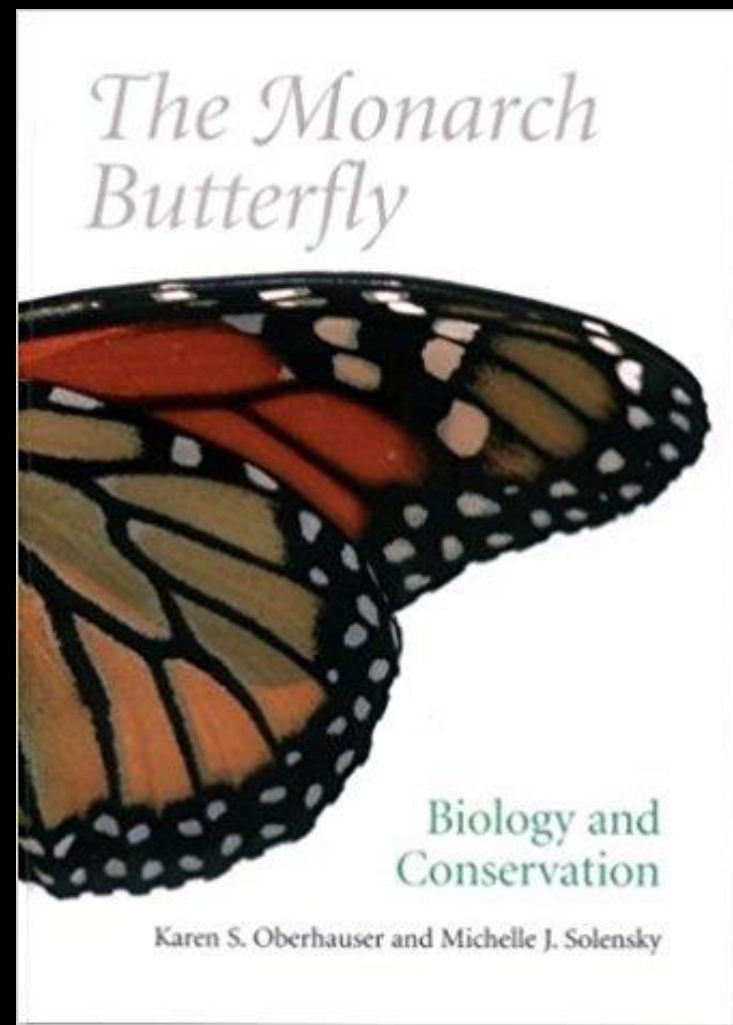
# Common Threads

- Is the weather in some ways correlated with the life patterns of the Monarchs?
  - How does rain affect the life patterns of the Monarch?
  - At the right are depicted change in pressure and humidity over time
  - Time is measured in five minute ticks



# Common Threads

- Oberhauser, K. S. (2004). *The Monarch butterfly: biology & conservation*. Ithaca: Cornell University Press.
  - An excellent collection of research about Monarchs
  - Covers breeding, migration and overwintering
  - This book cites opportunities for the collection of biotic data.
  - ISBN 978-0-8014-4188-2



# Flight Patterns

How are the physical motions of the Monarch influenced by its immediate environment?

- When people are cold it retards their motor skills
- When it rains, people without umbrellas want to get inside
- How does rainfall impact the motions of the Monarch?

First we have to understand their motions in ideal weather conditions.

- Take a look at the 3D plot on slide five
  - We are talking torrential downpour here!
  - How does the Monarch behave in weather like this?
  - Reproduce, pollinate, migrate (1,2,3)



# Abiotic or Weather Related Data

Measurement	Unit	Description
Timestamp	MM/DD/YY H:M:S	This is the primary key
Air Temperature	Celsius	
Air Pressure	Millibar	Or Hectopascal
Relative Humidity	Percent	
Dew Point	Celsius	
Rainfall	Millimeter	
Light 400-700 nm	Microeinstein	Number of photons hitting a meter squared; number of photons in a millionth of a mole of photons
Pyranometer	Watts per meter squared	
Soil Temperature	Celsius	
Soil Water Content	Meter cubed by meter cubed	Never higher than 50
Wind Direction	Degrees	North is 0°
Wind Speed	Meters per second	
Wind Gust Speed	Meters per second	



# Biotic Factors: an example observation

egg

location	timestamp	description	weight
F4UR	2017-07-06 18:25:14	Egg about to hatch	0.425 mg

- This is a sample transaction. An archetypal sort of table to maintain history of egg weight
- Location and timestamp are general fields; in the sense that they are part of all observations
- Text requires a person to read and interpret. So it is only *partially specific*.
- The egg weight - or other similar measurement - is specific. Almost entirely objective.