ARM CLIMATOLOGIES: AN EXPERIMENT IN OPEN PAPER DEVELOPMENT

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BACKGROUND

NSA: 1997

Image courtesy of the U.S. Department of Energy Atmospheric Radiation Measurement (ARM) user facility.
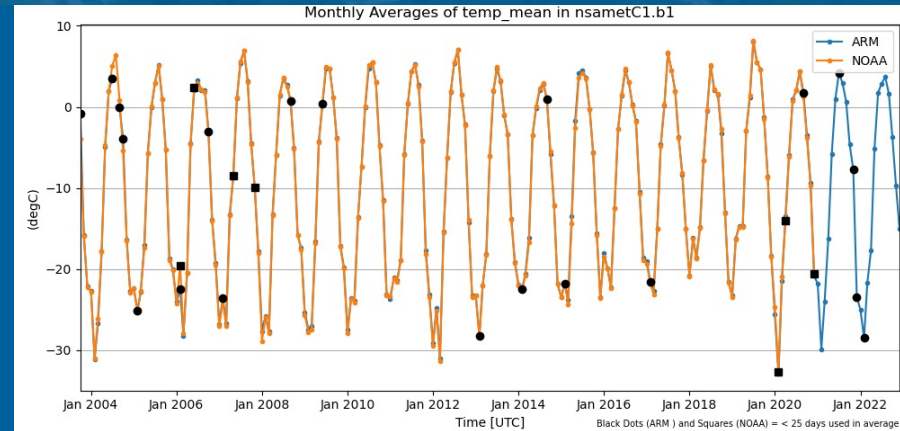
- ARM has a wealth of historical data

- Papers have been published on climatologies of various measurements but once published, those climatologies end

- Can we create a citable reference source for climatologies that are updated on a yearly basis?

SGP: 1993

Image courtesy of the U.S. Department of Energy Atmospheric Radiation Measurement (ARM) user facility

Photo by Nicki Hickmon, Argonne National Laboratory

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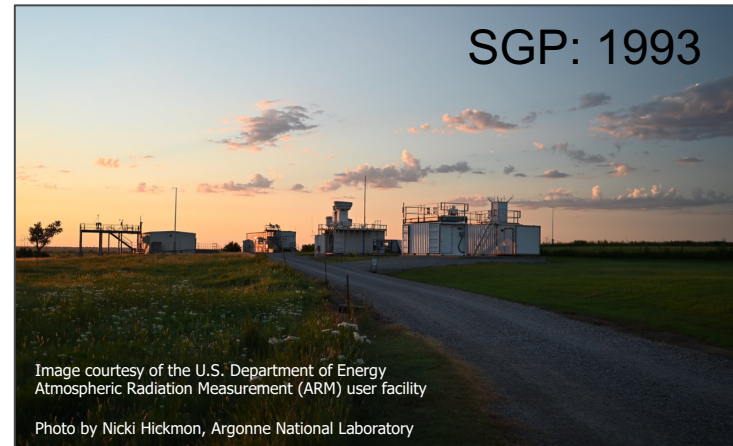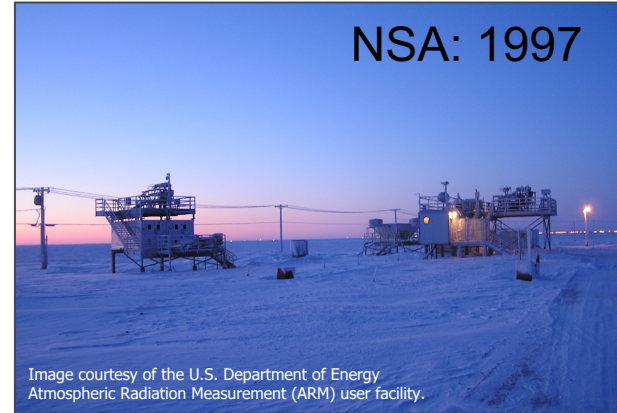
GITHUB REPOSITORY

ARM-Climatologies

- Using GitHub functionality we can
  - Add authors through pull request contributions
  - Create DOIs through Zenodo that auto-update with each new release
  - Provide open access and open reviews

North Slope of Alaska

Temperature

The NSA monthly temperatures from both the ARM and NOAA (NOOA Climate Reference Network) sites (Fig. 1) show a notable period from 2014–2019 where the average temperatures over the winter were higher as compared to the data from 2005–2013. In both datasets, there was a significant decrease in the monthly averages during the 2019–2020 winter. As shown in Figure 1, the agreement between the ARM and NOAA monthly averages validates that the ARM and NOAA temperature records are consistent and the slight deviations that are present are due to missing periods of data (black circle and sqaures). Yearly averaged temperature are likewise, very similar as shown in Figure 2. As noted, the increase in temperatures from 2014–2019 is visible in the yearly averages with that significant decrease in 2020 In Figures 1 and 2, the larger black dot indicate months where there were less than 25 days worth of data used to produce that average and as such likely has some bias. Data for these periods can be found in the results area of this repository.

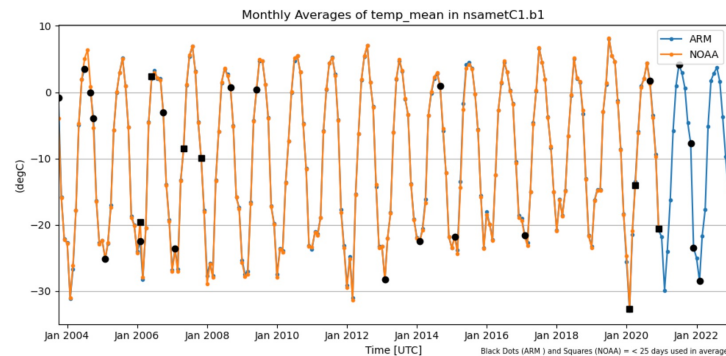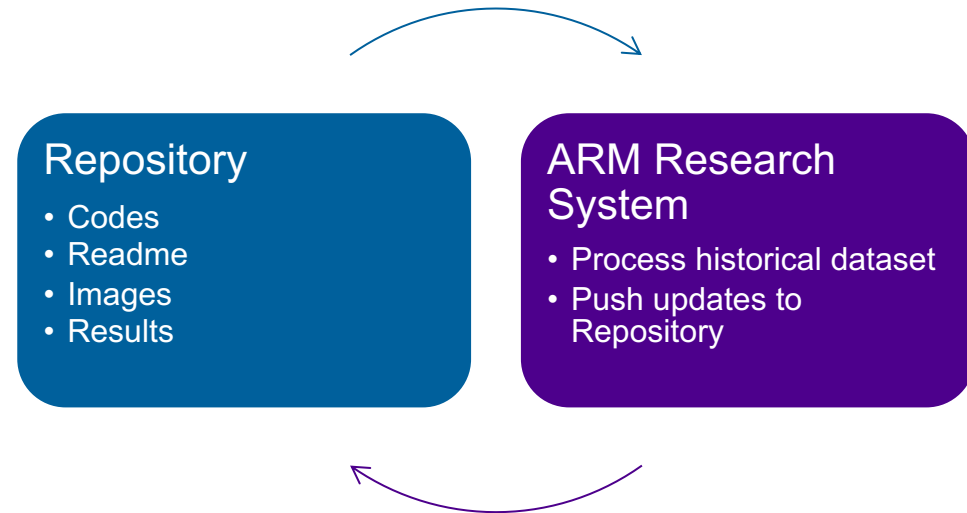Figure 1. Monthly average temperatures from ARM (blue) and NOAA (orange).

https://github.com/AdamTheisen/ARM-Climatologies

STRUCTURE

Codes and Processing

- arm_climatologies.py
  - Processes all data for monthly or yearly averages and writes to csv files (xarray)
  - Applies DQRs and QC to remove all bad and suspect data

- plot_climatology*.py
  - Various scripts to plot up the data in different views

- README.md
  - Contains the article text and formatting

Repository
- Codes
- Readme
- Images
- Results

ARM Research System
- Process historical dataset
- Push updates to Repository

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STRUCTURE
Contributions and Reviews

- Contributions can be accepted through the standard GitHub pull request process

- All contributors get added as Authors

- Reviews are the hard part!

- How do we solicit and track peer reviews to give this process more credibility?
  - Discussions?

⑂

Welcome to pull requests!

Pull requests help you collaborate on code with other people. As pull requests are created, they'll appear here in a searchable and filterable list. To get started, you should create a pull request.

Welcome to ARM-Climatologies Discussions!

📣 Announcements · AdamTheisen

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RESULTS

- NSA Climatologies
  - Surface Temperature
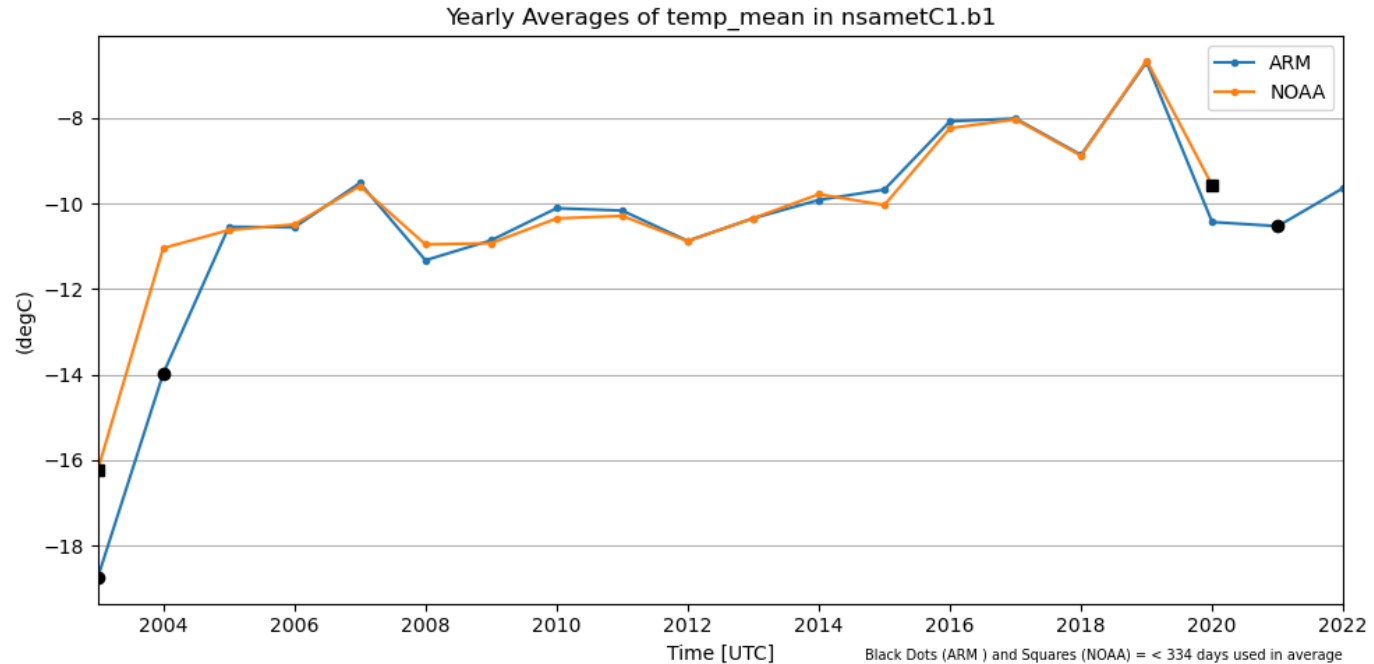 - Precipitation

- In Progress
  - NSA Surface RH
  - SGP (T/RH/Precip)

Kyrouac, J., & Shi, Y. Surface Meteorological Instrumentation (MET). Atmospheric Radiation Measurement (ARM) User Facility. https://doi.org/10.5439/1786358

NOAA Climate Reference Network (60NOAACRN). Atmospheric Radiation Measurement (ARM) User Facility.

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NSA
Temperature – Yearly Average

Yearly Averages of temp_mean in nsametC1.b1

NSA
Temperature – Monthly Average

Monthly Averages of temp_mean in nsametC1.b1

Black Dots (ARM) and Squares (NOAA) = < 25 days used in average
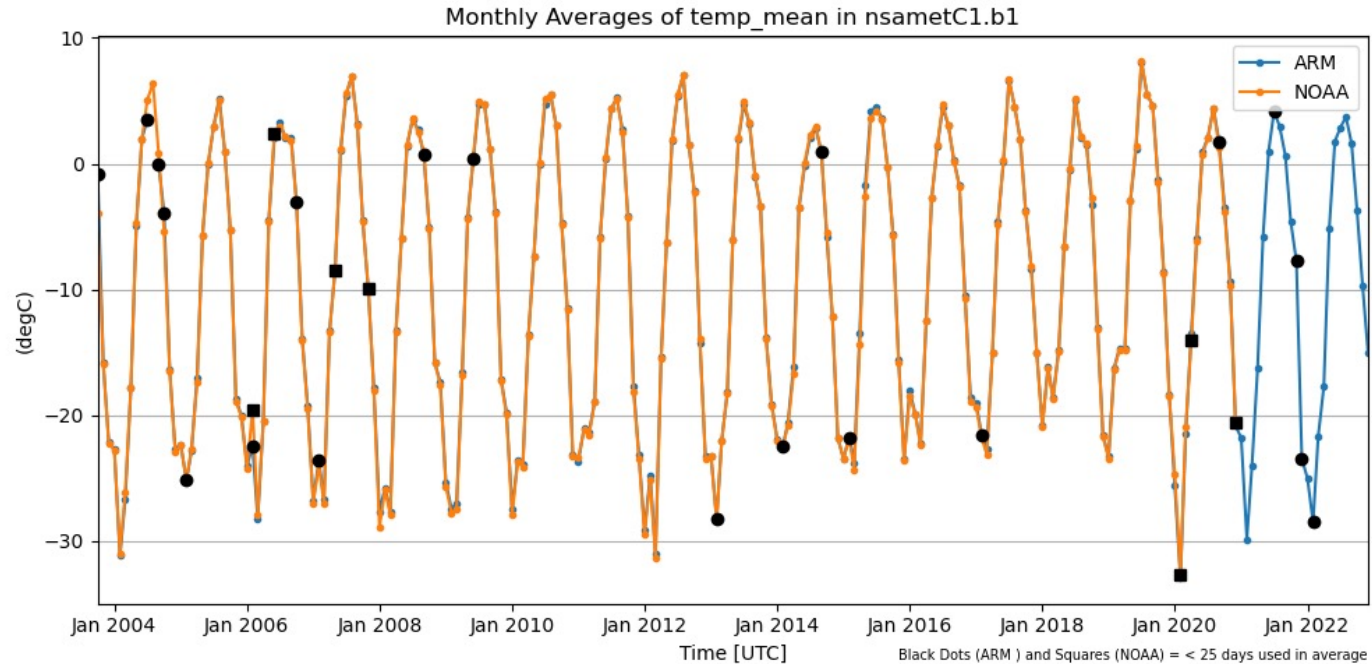
NSA
Precipitation – Yearly Average (NOAA Weighing Bucket)

Yearly Averages of precipitation in nsa60noaacrnX1.b1
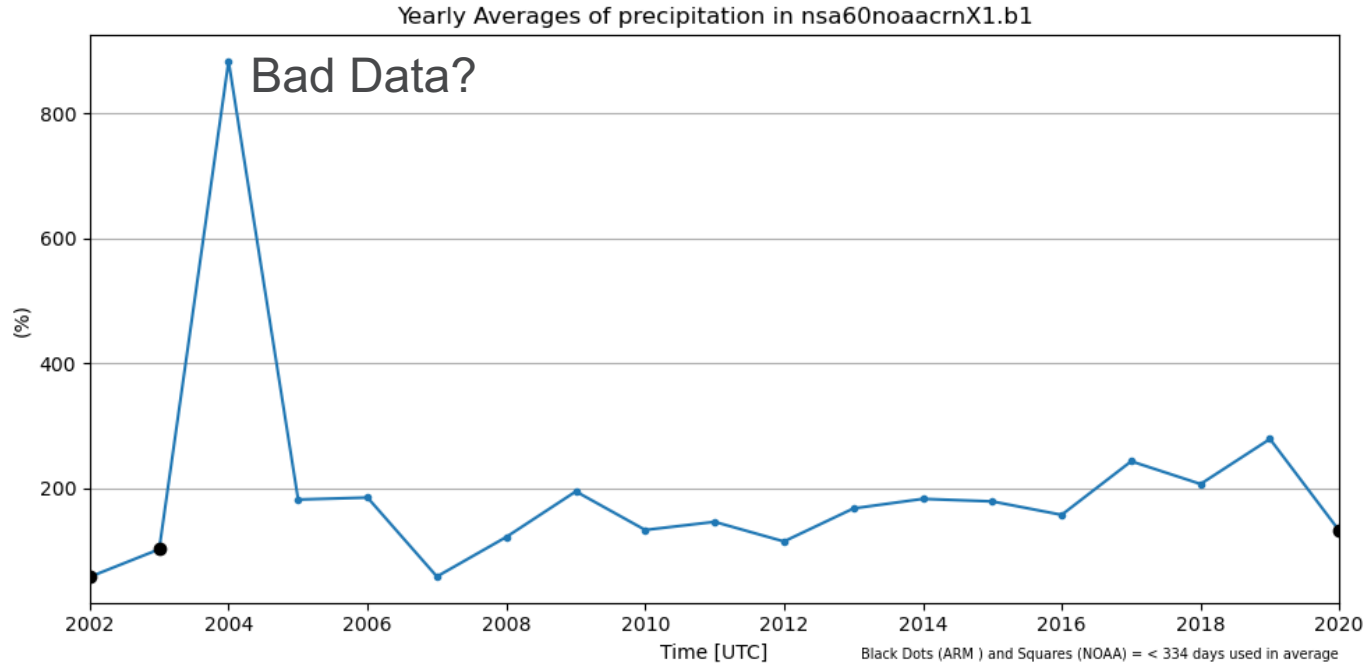
SGP E13
Yearly Temperature and RH

- Significant warm years in 2006 and 2012 followed by periods of relatively lower temperatures
- Yearly average temperature is more steady in recent years

Yearly Averages of temp_mean in sgpmetE13.b1

Black Dots (ARM) and Squares (NOAA) = < 334 days used in average

Yearly Averages of rh_mean in sgpmetE13.b1

Black Dots (ARM) and Squares (NOAA) = < 334 days used in average

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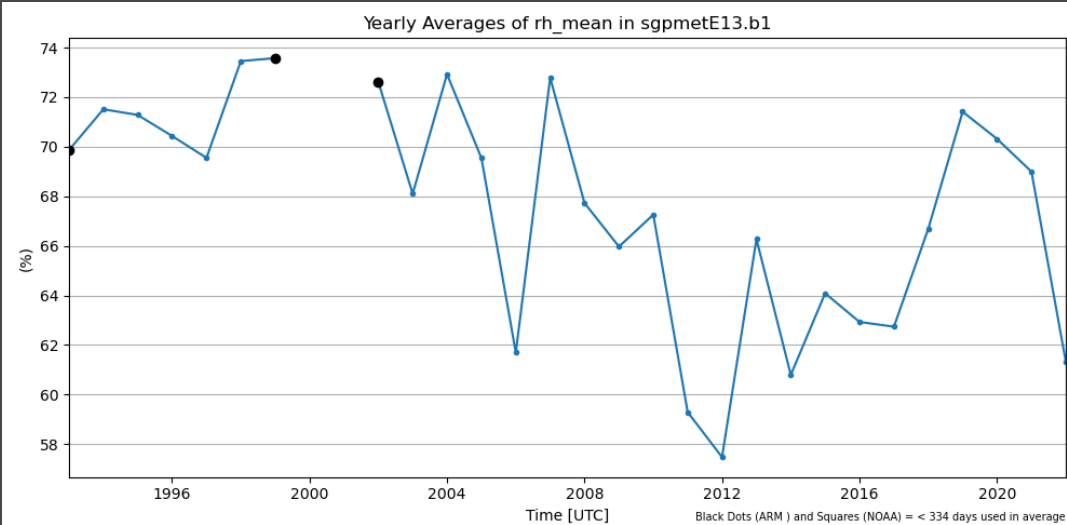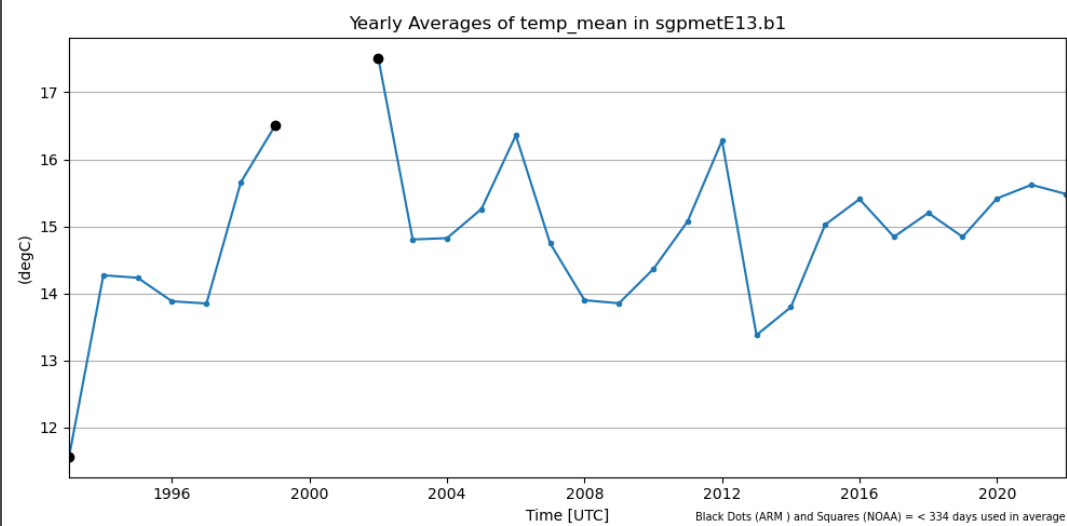
SUMMARY

- ARM-Climatologies repository showcases a way to provide routinely updated climatologies in a citable source by using GitHub

- Generally update the data in January for the previous year
  - Idea is to eventually automate the processing and commit to GitHub

- Open for collaborations, additions, reviews, etc…

- Future steps are to expand to other sites/measurements

DOI 10.5281/zenodo.6685908

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QUESTIONS?