

The background of the slide is a light gray gradient. It is decorated with numerous realistic water droplets of various sizes. Some droplets are at the top left, some are at the bottom right, and others are scattered in the center. Each droplet has a highlight and a shadow, giving it a three-dimensional appearance.

SNOWFALL DISTRIBUTION

A COMPARISON OF SNOWFALL DISTRIBUTION ON THE EASTERN AND
WESTERN SIDE OF THE CONTINENTAL DIVIDE

RESEARCH BACKGROUND

- HOW DOES BEING ON ONE SIDE OF THE CONTINENTAL DIVIDE EFFECT SNOWFALL THROUGHOUT THE WINTER?
- IT IS OFTEN SAID THAT STATES EAST OF THE DIVIDE RECEIVE MORE SNOWFALL LATER IN THE WINTER

HYPOTHESIS

- UTAH AND IDAHO RECEIVE A HIGHER PROPORTION ($>50\%$) OF TOTAL SNOWFALL IN JAN & FEB THAN COLORADO AND WYOMING DO IN JAN & FEB
- COLORADO AND WYOMING RECEIVE A HIGHER PROPORTION ($>50\%$) OF TOTAL SNOWFALL IN MAR & APRIL THAN UTAH AND IDAHO DO IN MAR & APRIL

DATA

- CAME FROM NOAA'S NATIONAL CENTER FOR ENVIRONMENTAL INFORMATION (NCEI)
- SPECIFICALLY USING THE GHCND
- "THE GLOBAL HISTORICAL CLIMATOLOGY NETWORK DAILY (GHCND) IS AN INTEGRATED DATABASE OF DAILY CLIMATE SUMMARIES FROM LAND SURFACE STATIONS ACROSS THE GLOBE. GHCND IS MADE UP OF DAILY CLIMATE RECORDS FROM NUMEROUS SOURCES THAT HAVE BEEN INTEGRATED AND SUBJECTED TO A COMMON SUITE OF QUALITY ASSURANCE REVIEWS."
 - DATA DESCRIPTION M

DATA COLLECTION

- DOWNLOADED A LIST OF ALL STATIONS THEN FILTERED DOWN TO JUST THE ONES WITHIN THE SCOPE OF THE ANALYSIS
- USING A FOR LOOP TO THEN DOWNLOAD DATA FOR ALL THESE STATIONS

DATA COLLECTION

- DATA WAS PULLED DIRECTLY FROM THE NOAA WEBSITE USING FTP AND A LOOP OF ALL STATIONS WITH THE APPROPRIATE DATE RANGE

```
: %%R
for (i in 1:numFiles) {
  infile <- paste0(dirname, station_list$GHCND[i], ".dly")
  outfile <- paste0(noaaout, station_list$GHCND[i], ".csv")
  cols <- c( "A11", "I4", "I2", "A4",
            rep( c( "I5", "A1", "A1", "A1"), 31) )
  df <- read.fortran(infile, cols, na.strings="-9999") # -9999 indicates missing data

  # next, fill in the column names
  tmp <- c("Val", "xxM", "xxQ", "xxS") # xx so we can ditch them later
  vhdrs <- paste( rep(tmp,31), rep(1:31,each=4), sep="")
  hdrs <- c("ID", "year", "month", "element", vhdrs)
  names(df) <- hdrs
  df <- df[df$year >= 1995 & df$year <= 2020,]
  df_out <- dplyr::select(df, -matches("xx*")) # get rid of M, Q, S
  write.csv(df_out, outfile)
}
```

DATA WRANGLING

- THE DATA WAS ORGANIZED WITH EACH FILE BEING A MONTH FOR ONE STATION
- THESE FILES WERE COMBINED INTO A SINGLE FILE AND THEN FILTERED DOWN TO ONLY THE WINTER MONTHS (JAN-APRIL FOR THIS STUDY)

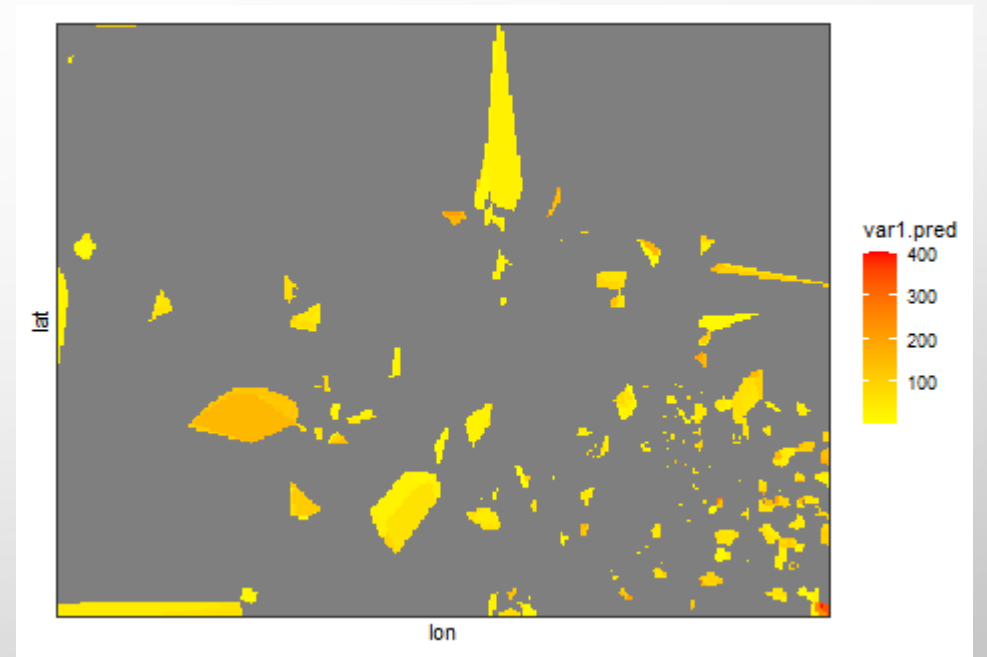
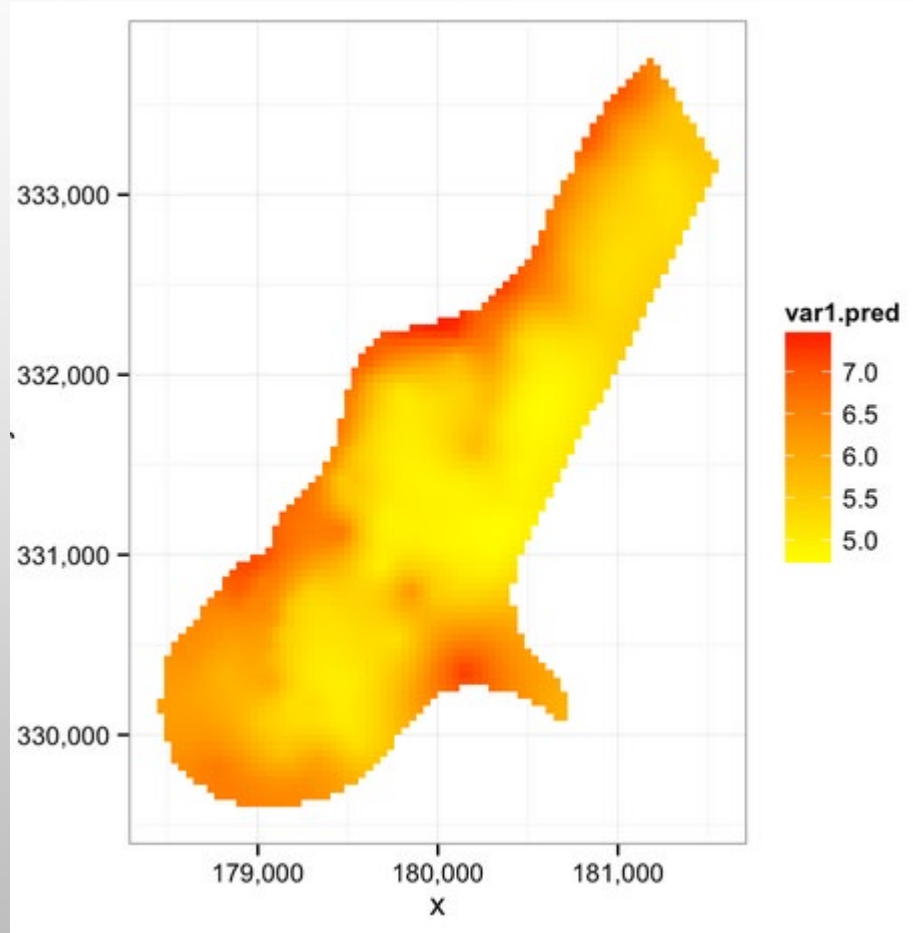
ANALYSIS

- TWO DIFFERENT APPROACHES:
 - KRIGING TO INPUT MISSING DATA
 - MANNWHITNEYU TO TEST HYPOTHESIS

KRIGING

- NOT DIFFICULT TO IMPLEMENT ON SMALLER DATASETS
- PROBLEMS OCCURRED DUE TO THE LARGE AREA OF MY ANALYSIS AND LIMITED DATA COLLECTION POINTS
 - UTAH, COLORADO, IDAHO AND WYOMING
 - WEATHER STATIONS ARE ONLY WHERE SOCIETY HAS DEEMED IMPORTANT SO LARGE SWATHS OF THE AREA ARE NOT REPRESENTED IN THE DATA
- WOULD LIKELY WORK MUCH BETTER ON NEW ENGLAND STATES DUE TO SMALL AREA AND HIGH NUMBER OF POINTS

EXPECTED RESULTS VS. OBSERVED RESULTS



Gray represents no predictions (NA)

MANNWHITNEYU TEST RESULTS

- UTAH AND IDAHO RECEIVE A HIGHER PROPORTION (>50%) OF TOTAL SNOWFALL IN JAN & FEB THAN COLORADO AND WYOMING

```
stats.mannwhitneyu(UTID12, WYC012, alternative='greater')
```

- RESULT:

```
MannwhitneyuResult(statistic=992193232.0, pvalue=0.3422076652274443)
```

- FAIL TO REJECT NULL HYPOTHESIS

- COLORADO AND WYOMING RECEIVE A HIGHER PROPORTION (>50%) OF TOTAL SNOWFALL IN MAR & APRIL THAN UTAH AND IDAHO DO IN MAR & APRIL

- RESULT:

```
stats.mannwhitneyu(WYC034, UTID34, alternative='greater')
```

```
MannwhitneyuResult(statistic=322724868.5, pvalue=2.4445271794549023e-43)
```

- REJECT NULL, CO & WY RECEIVE MORE SNOW THAN UT & ID IN MAR/APRIL

DISCUSSION

- THE DATA WAS THE LIMITING FACTOR IN THIS ANALYSIS, DUE BOTH TO LACK OF OBSERVATIONS AND SHORT TIME HORIZON
- FUTURE WORK WOULD INCORPORATE AS LONG A TIMEFRAME AS POSSIBLE TO INCORPORATE CHANGES DUE TO CLIMATE CHANGE