india_monsoon

Anastacia Wienecke

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Install and load packages:

```r
### Read in rainfall data (annual per Indian state from 1901-2017)
rains <- read.csv("data/india_rains.csv") %>%
         select(-Name,-Jan.Feb,-Mar.May,-June.September,-Oct.Dec)

### Compute median and variance in annual rainfall per state
meds <- rains %>%
        group_by(SUBDIVISION) %>%
        summarise_at(vars(ANNUAL), list(median=median, variance=var))
meds$stdev <- sqrt(meds$variance)
meds$stdev.norm <- meds$stdev / meds$median
meds.order <- meds$SUBDIVISION[order(meds$median, decreasing = TRUE)]


### Plot sampling locations on map, color by median annual rainfall
### At the top left, click the layers button below the zoom function. Select "Esri.WorldImagery" to see
latlong <- rains %>%
           select(SUBDIVISION, Latitude, Longitude) %>%
           distinct() %>%
           left_join(meds, by="SUBDIVISION")

minmed <- meds$median %>% min() %>% floor()
maxmed <- meds$median %>% max() %>% ceiling() + 300
breaks <- seq(from=minmed, to=maxmed, by=300)
ranges <- length(breaks)
colors <- rainbow(n = ranges)
india  <- mapview(latlong, xcol = "Longitude", ycol = "Latitude", crs = 4269, grid = FALSE, zcol="media
india
```
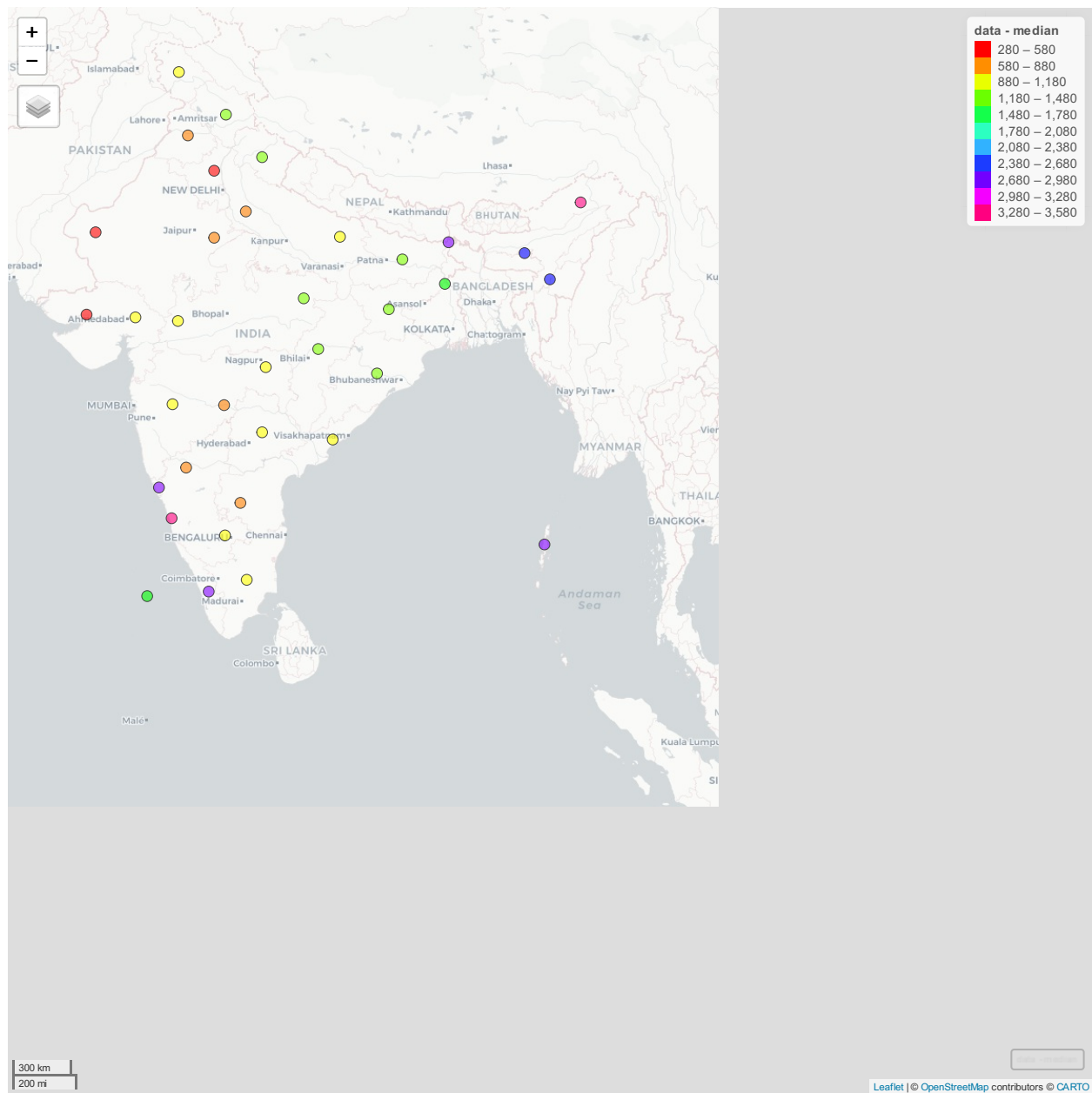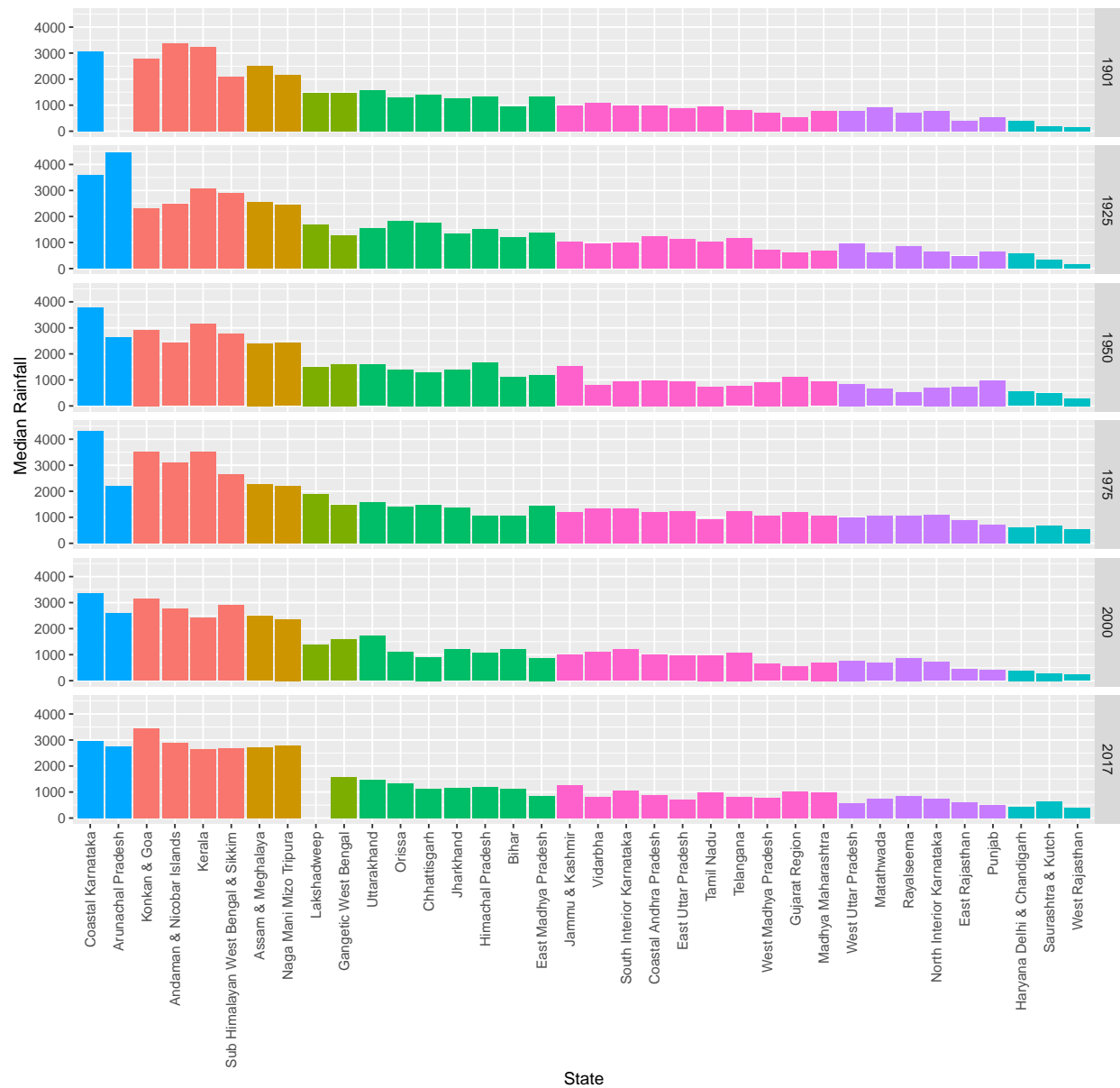
data - median
- 280 – 580
- 580 – 880
- 880 – 1,180
- 1,180 – 1,480
- 1,480 – 1,780
- 1,780 – 2,080
- 2,080 – 2,380
- 2,380 – 2,680
- 2,680 – 2,980
- 2,980 – 3,280
- 3,280 – 3,580

```
mapshot(india, file = "figures/india.png")
saveWidget(india@map, file="figures/india.html")
```
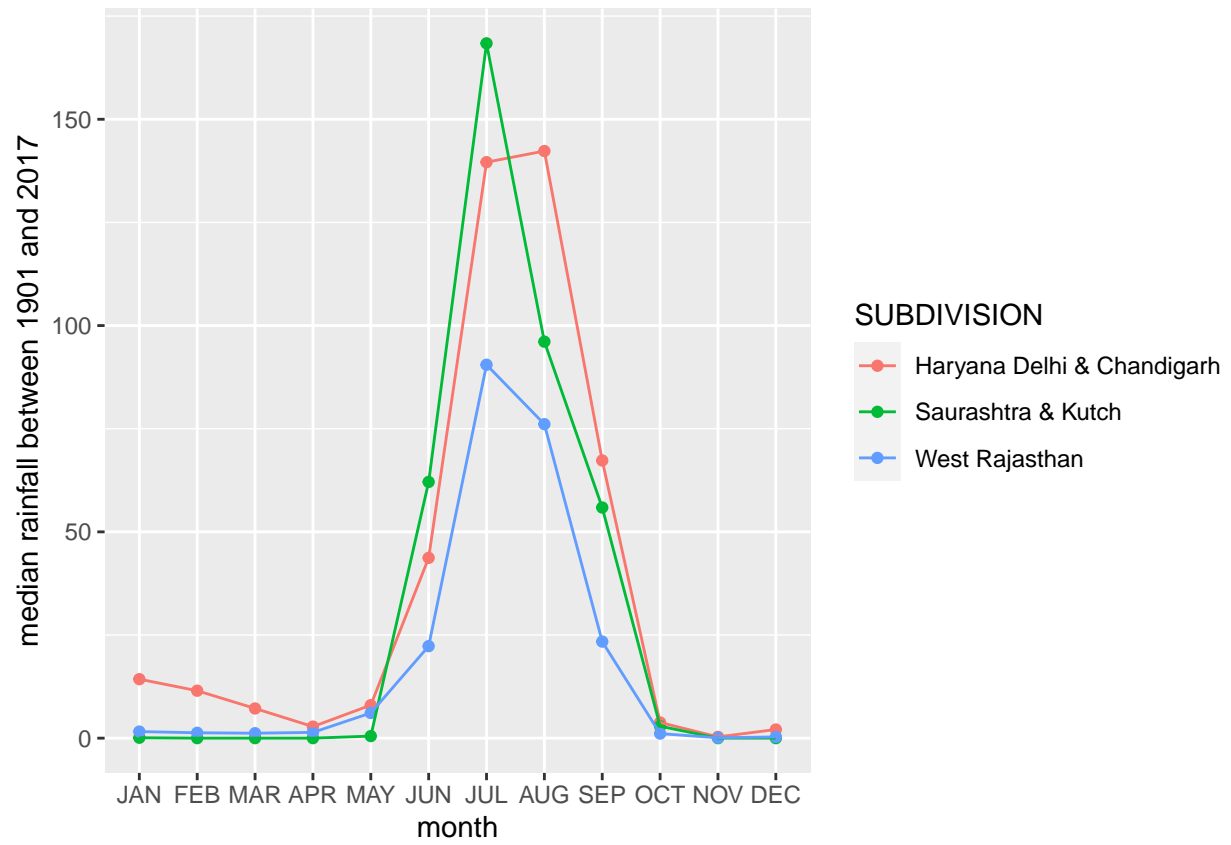
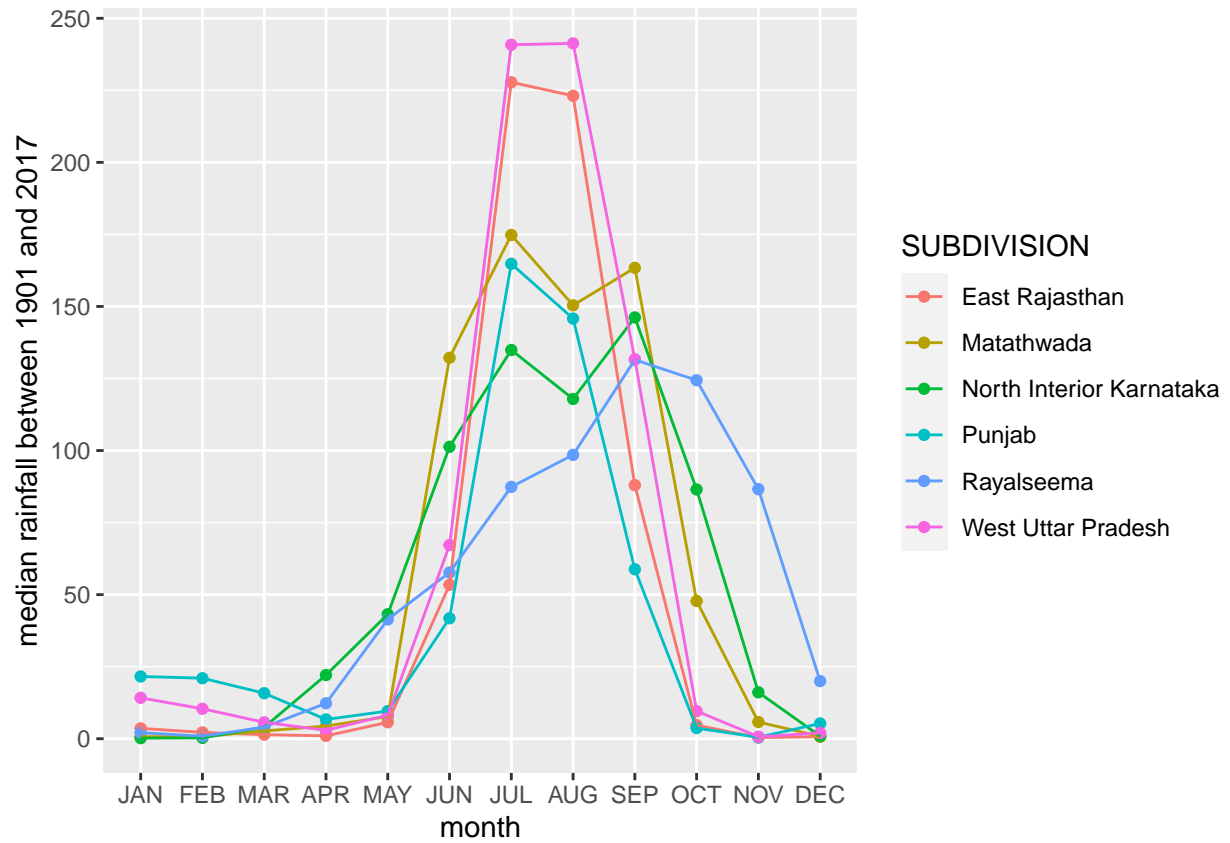Barplot of annual rainfall for years 1901, 1925, 1950, 1975, 2000, and 2017


```
## Saving 10 x 10 in image

## Saving 6.5 x 4.5 in image
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## [[1]]
```
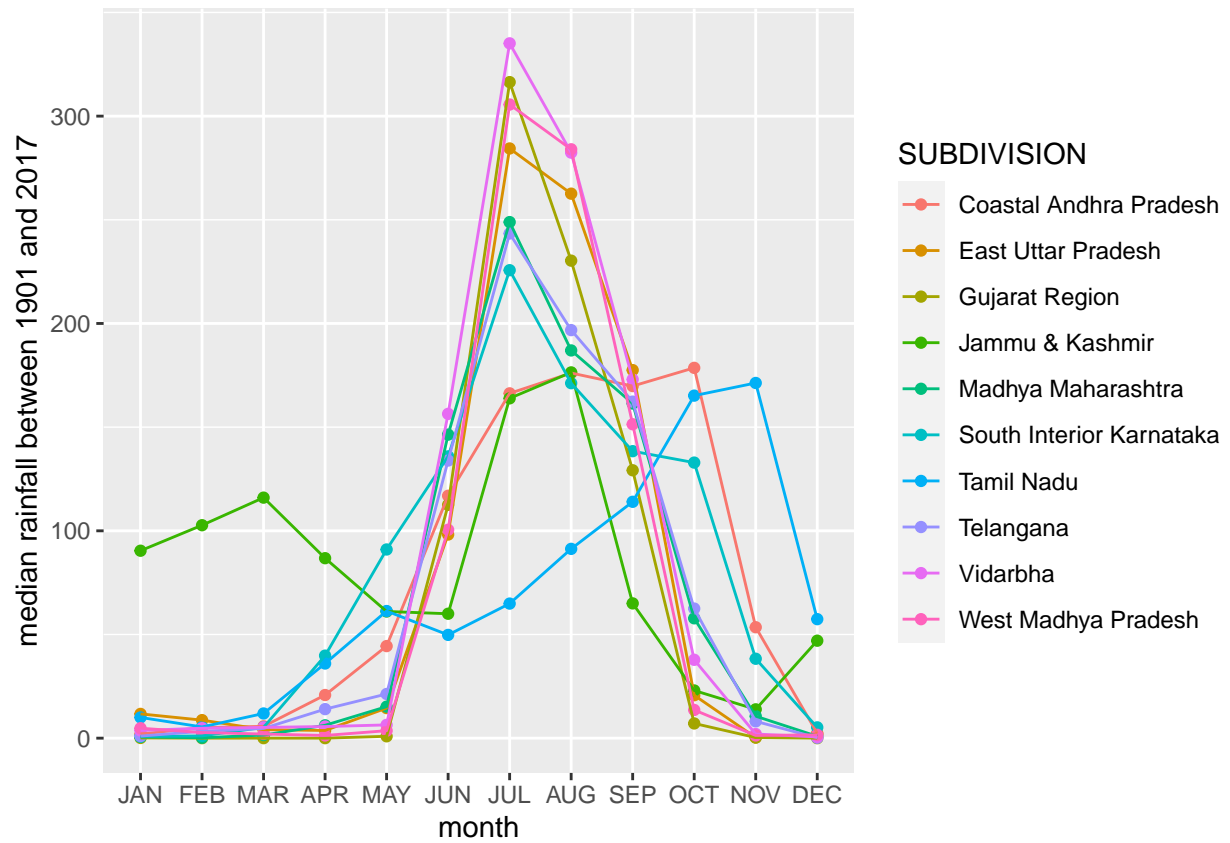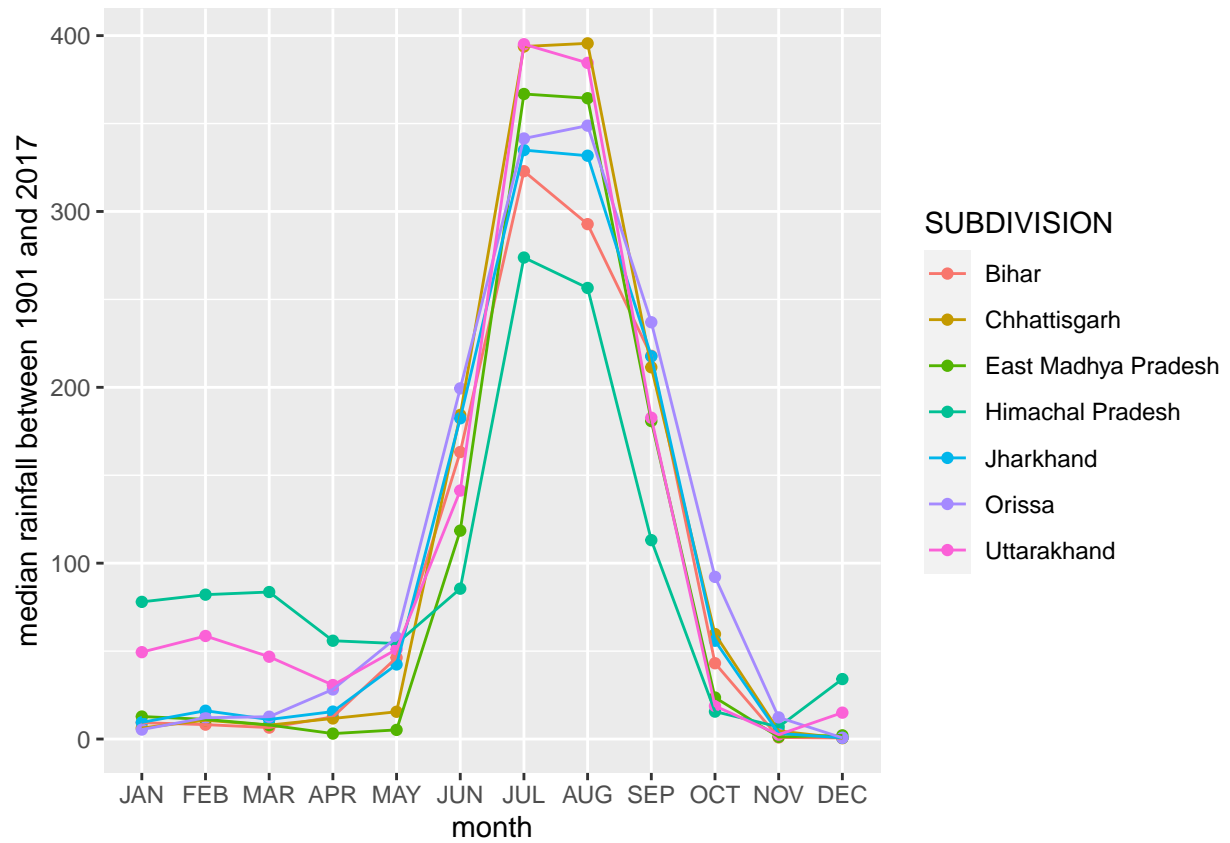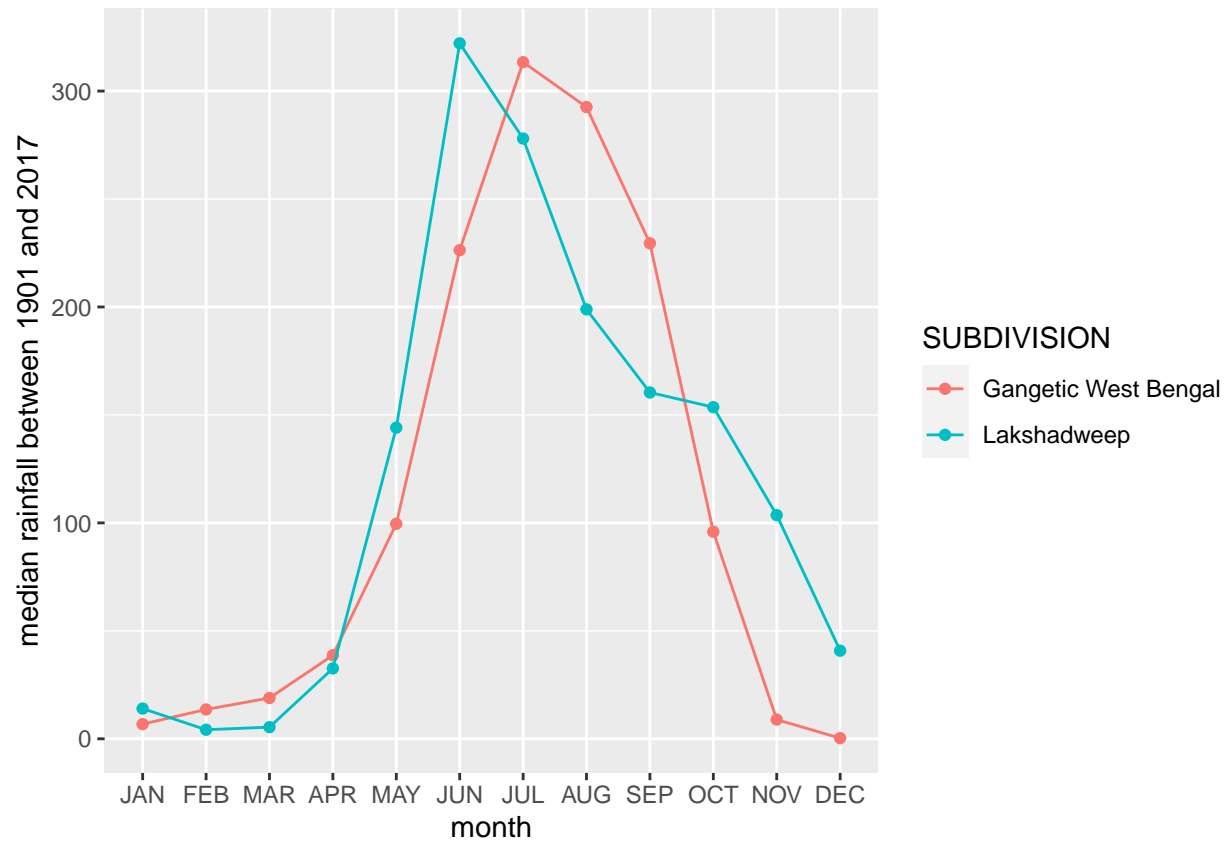
```
## 
## [[2]]
```
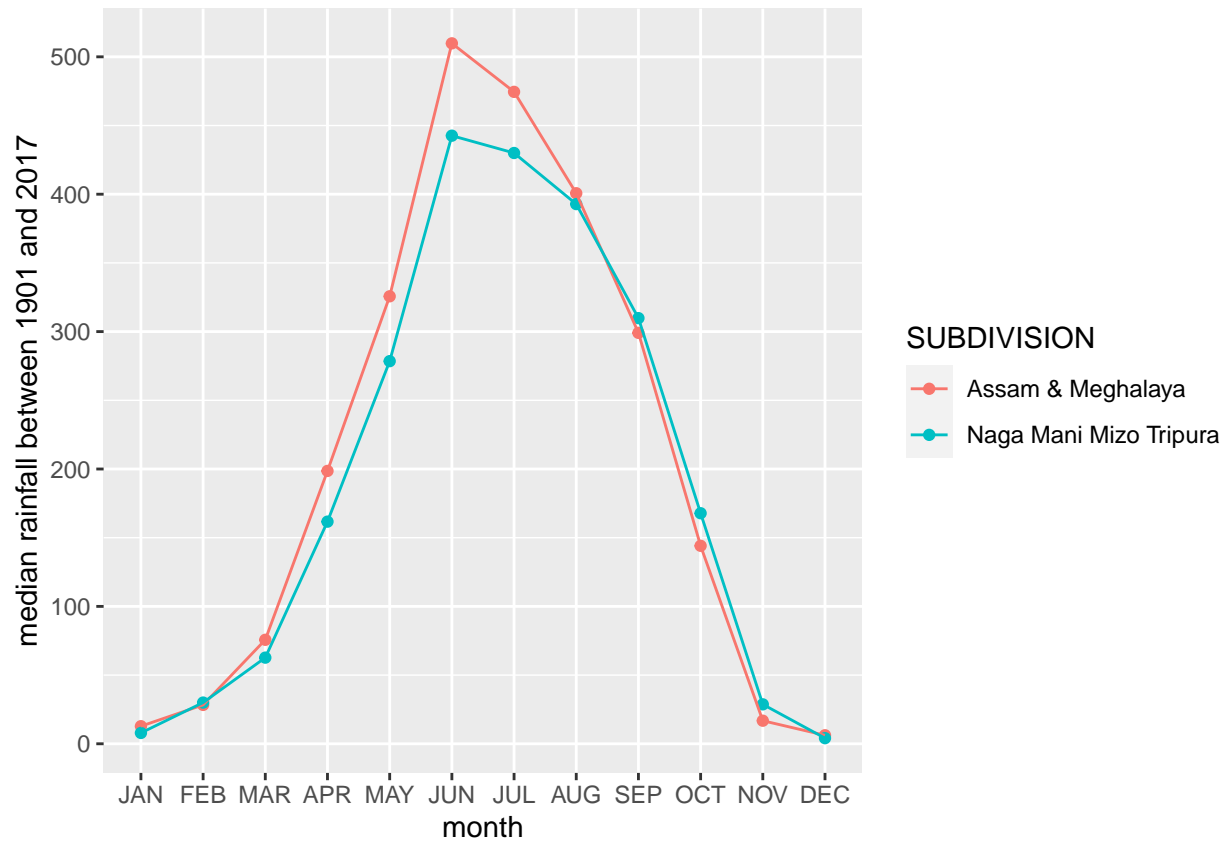
```
## 
## [[3]]
```
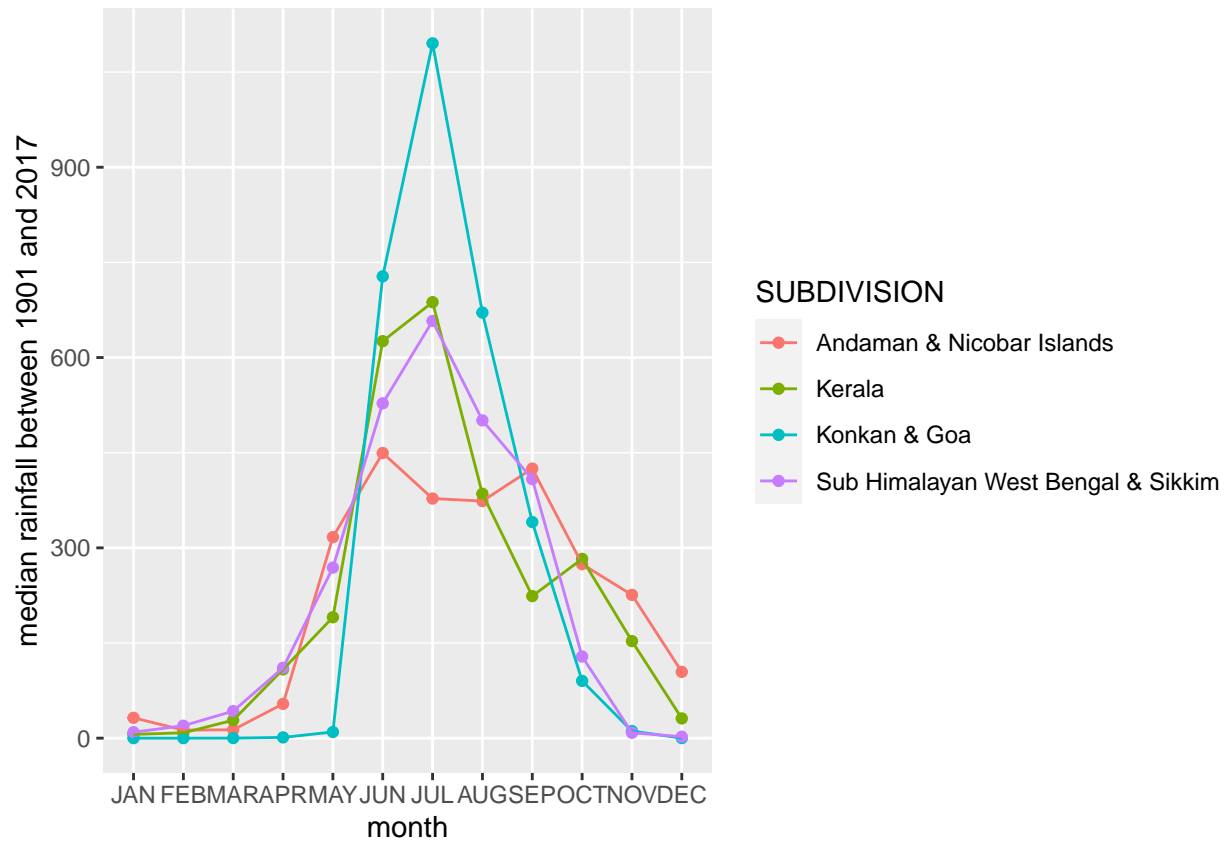
```
## 
## [[4]]
```
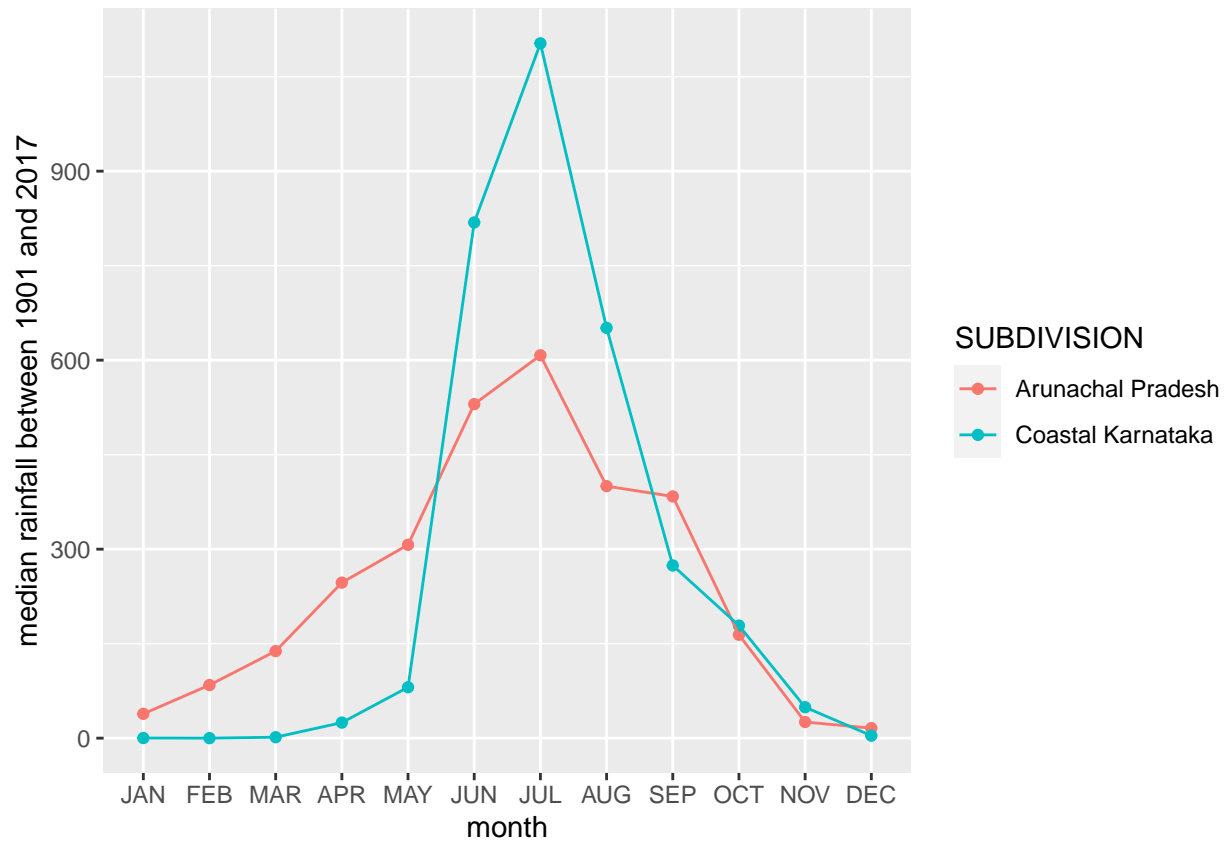
```
## 
## [[5]]
```

```
## 
## [[6]]
```

```
##
## [[7]]
```
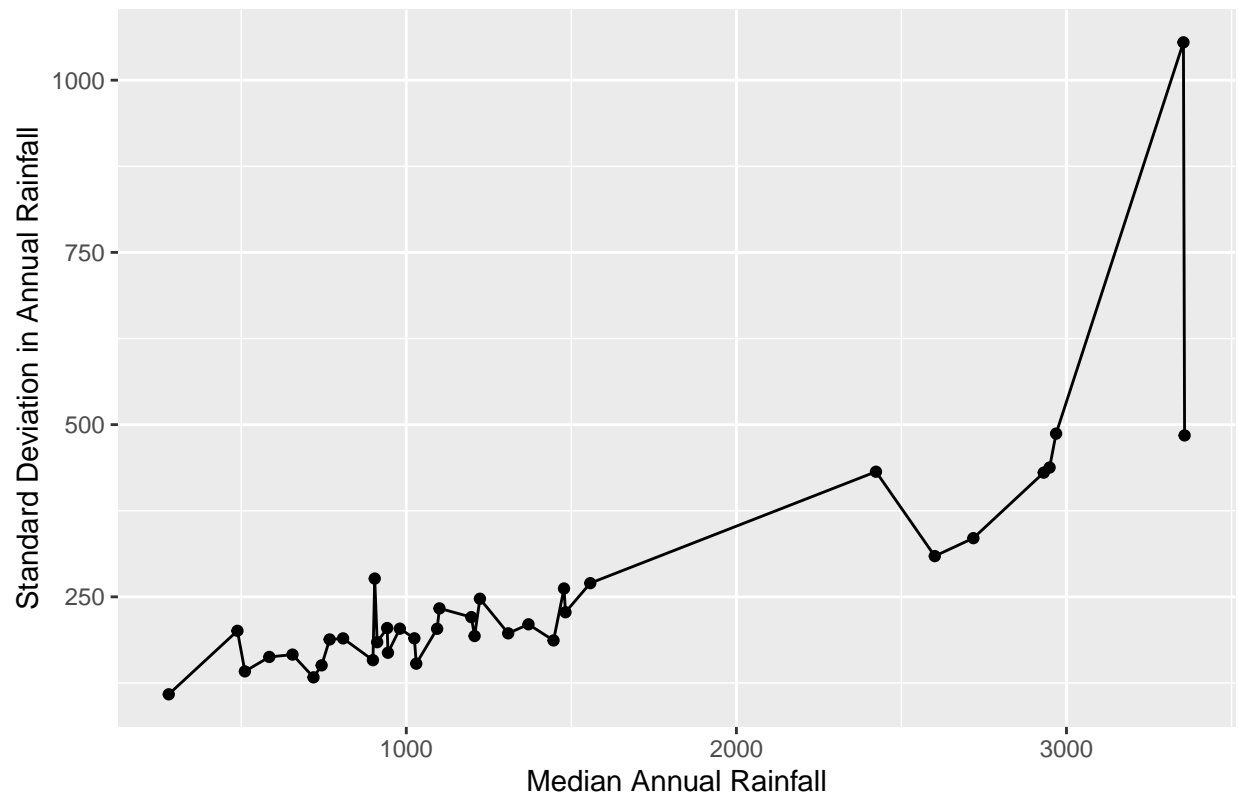
```
## 
## [[8]]
```

```
### Comparison of median annual rainfall and the standard deviation in annual rainfall
# Non-normalized
nnorms <- ggplot(data=meds, aes(x=median, y=stdev)) +
                geom_line() +
                geom_point() +
                labs(x = "Median Annual Rainfall",
                     y = "Standard Deviation in Annual Rainfall",
                     title = "Line plot of median annual rainfall vs. the standard deviation in annual rain
ggsave("figures/lineplot_median_stdev_rainfall.png", nnorms)
```

```
## Saving 6.5 x 4.5 in image
```

```
nnorms
```

Line plot of median annual rainfall vs. the standard deviation in annual rain

```
# Normalized
norms <- ggplot(data=meds, aes(x=median, y=stdev.norm)) +
            geom_line() +
            geom_point() +
            labs(x = "Median Annual Rainfall",
                y = "Scaled Standard Deviation in Annual Rainfall",
              title = "Line plot of median annual rainfall vs. the scaled standard deviation in annua
ggsave("figures/lineplot_median_norm_stdev_rainfall.png", norms)
```

```
## Saving 6.5 x 4.5 in image
```

```
norms
```

Line plot of median annual rainfall vs. the scaled standard deviation in annu
(standard deviation divided by median)