

# Manapouri Water Valuation Comparison

Base (1931-2023) vs. New (1991-2020)

Benjamin Preston

2024-09-02

```
# Load in WVs from full run (91 years + mean joiner)
# # Run 0020 - 1931-2023 + joiner
# Load in WVs from alternate data set
# Run 0023 - 1931-1960 + joiner
# Run 0025 - 1941-1970 + joiner
# Run 0028 - 1951-1980 + joiner
# Run 0030 - 1961-1990 + joiner
# Run 0032 - 1971-2000 + joiner
# Run 0037 - 1981-2010 + joiner
# Run 0035 - 1991-2020 + joiner

weeks <- 54
burnin <- 80

df <- read_csv("Apr24B_AVG_0020_WVX.csv", show_col_types = FALSE) |>
  mutate(rn = row_number(),
         week = (rn - 1) %% (weeks + burnin) + 1,
         other_storage = floor((rn-1)/(weeks + burnin)),
         other_storage = round(other_storage / 12 * 100),
         ) |>
  select(-rn) |>
  pivot_longer(-c(week, other_storage),
               names_to = "storage", values_to = "wv_base") |>
  mutate(storage = round(as.double(storage)*100),
         wv_base = as.double(wv_base),
         os_label = paste0("OS", str_pad(other_storage, width = 3, pad = "0"))
         )

new <- read_csv("Apr24B_AVG_0035_WVX.csv", show_col_types = FALSE) |>
  mutate(rn = row_number(),
         week = (rn - 1) %% (weeks + burnin) + 1,
         other_storage = floor((rn-1)/(weeks + burnin)),
         other_storage = round(other_storage / 12 * 100),
         ) |>
  select(-rn) |>
  pivot_longer(-c(week, other_storage),
               names_to = "storage", values_to = "wv_new") |>
  mutate(storage = round(as.double(storage)*100),
         wv_new = as.double(wv_new)
         )
```

```
## join the two data sets
```

```
if (dim(df)[1] != dim(new)[1]) {  
  stop("Data sets are not the same length")  
} else {  
  df <- df |>  
    bind_cols(new[, "wv_new"])  
}
```

```
week <- 1:(weeks-1)
```

```
wv <- 2^(0:12)
```

```
other_storage <- df |>  
  distinct(other_storage) |>  
  arrange(other_storage) |>  
  pull(other_storage)
```

```
storage_df <- expand_grid(week = week,  
                        wv = wv,  
                        other_storage = other_storage)
```

```
storage_base <- function(wv, week, other_storage) {  
  # filter data by week and storage level  
  filtered_df <- df |>  
    filter(week == !!week, # !! is the unquote operator  
          other_storage == !!other_storage)  
  
  # check that there are enough data points to interpolate  
  if (nrow(filtered_df) < 2) {  
    stop("Not enough data points to interpolate")  
  }  
  
  # interpolate the data using approx()  
  storage_base <- approx(x = filtered_df$wv_base,  
                        y = filtered_df$storage,  
                        xout = wv, rule = 2)$y  
  
  return(storage_base)  
}
```

```
storage_new <- function(wv, week, other_storage) {  
  # filter data by week and storage level  
  filtered_df <- df |>  
    filter(week == !!week,  
          other_storage == !!other_storage)  
  
  # check that there are enough data points to interpolate  
  if (nrow(filtered_df) < 2) {
```

```

    stop("Not enough data points to interpolate")
  }

  # interpolate the data using approx()
  storage_new <- approx(x = filtered_df$wv_new,
                       y = filtered_df$storage,
                       xout = wv, rule = 2)$y

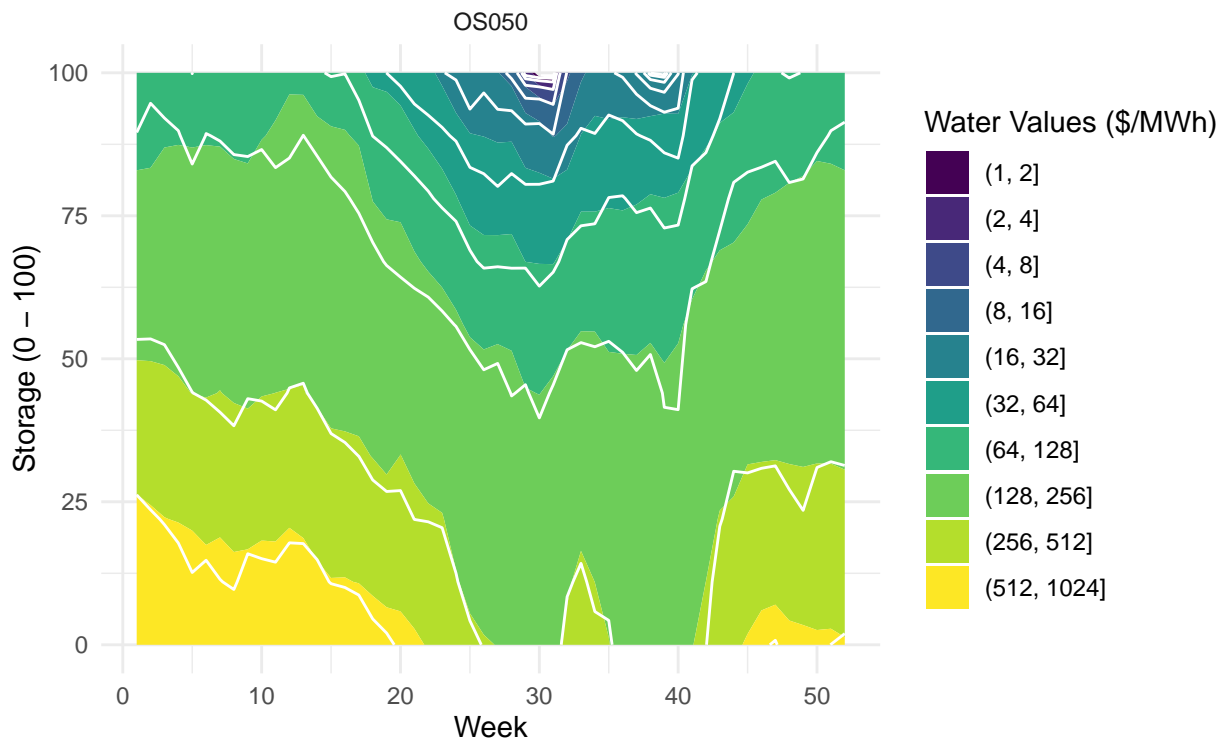
  return(storage_new)
}

storage_df <- storage_df |>
  mutate(stor_base = pmap_dbl(list(wv, week, other_storage), storage_base),
         stor_new = pmap_dbl(list(wv, week, other_storage), storage_new),
         stor_diff = stor_new - stor_base,
         sq_stor_diff = stor_diff^2,
         os_label = paste0("OS", str_pad(other_storage, width = 3, pad = "0"))
  )

```

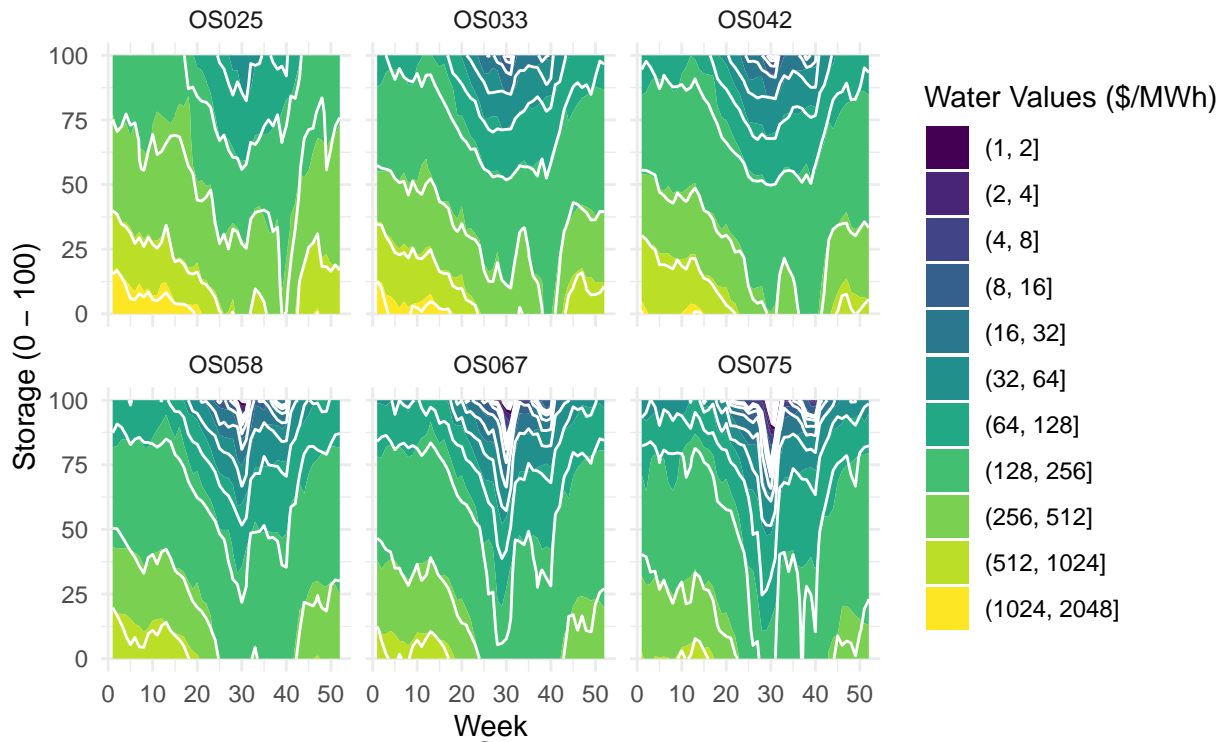
## Manapouri Water Value Comparison

Mid Other Storage (OS) Level == 50



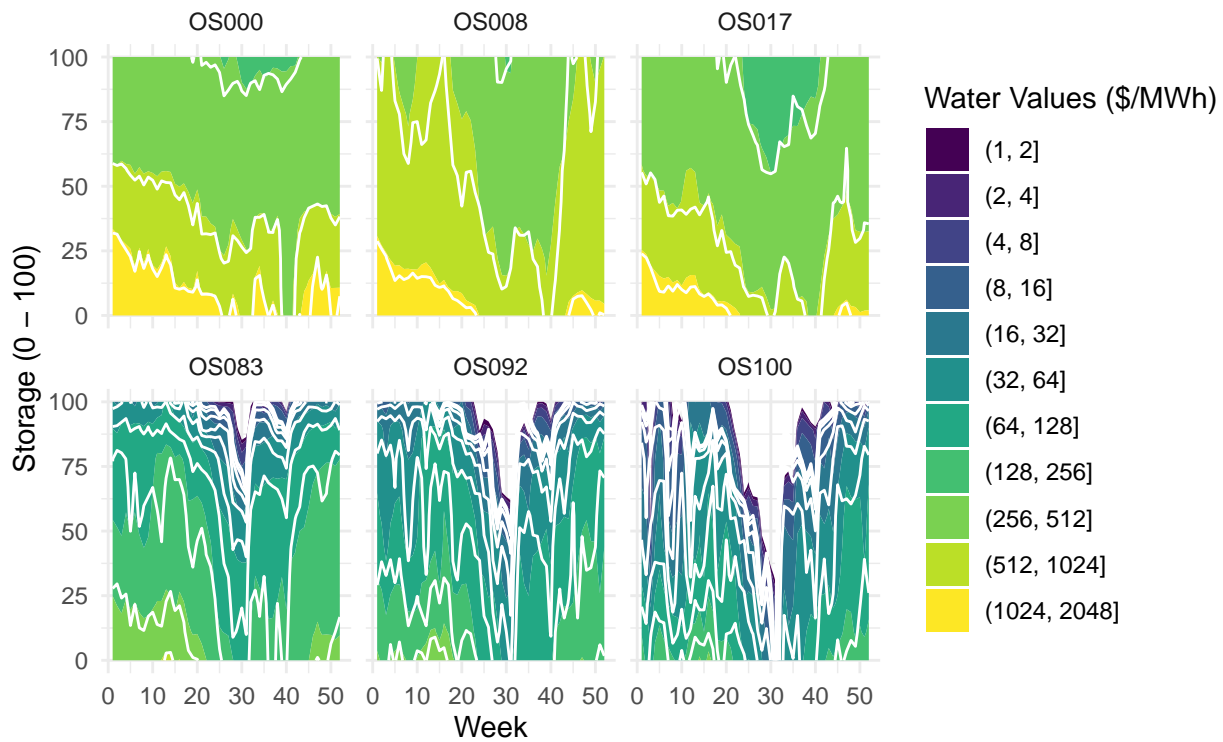
## Manapouri Water Value Comparison

Faceted by Inner Other Storage Levels ( $25 < OS < 75$ )

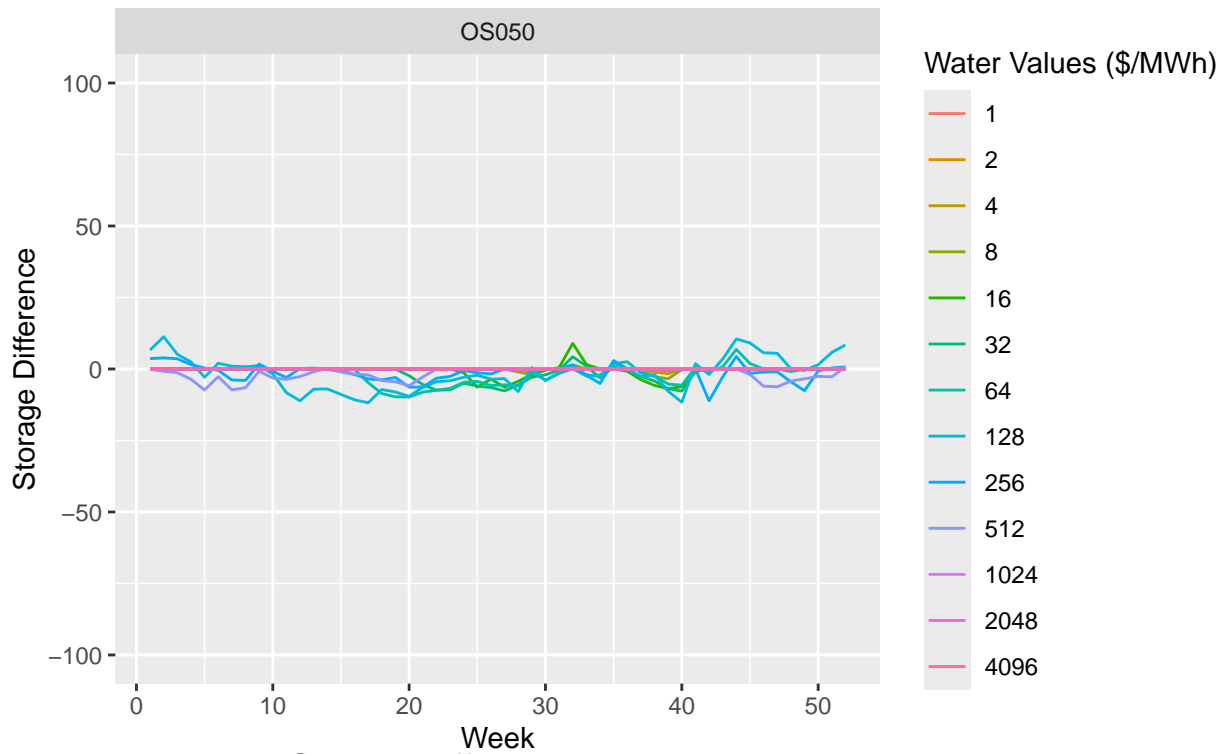


## Manapouri Water Value Comparison

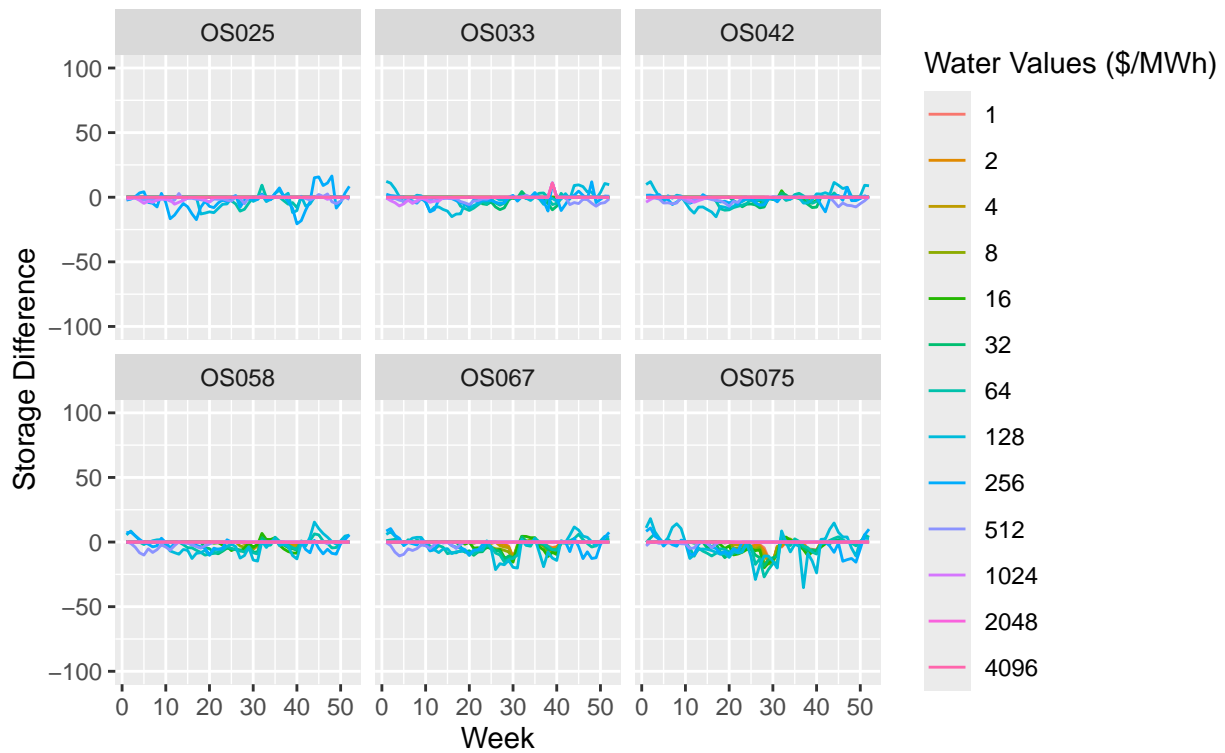
Faceted by Outer Other Storage Levels ( $OS < 25 \mid OS > 75$ )



Manapouri Storage Difference  
Mid Other Storage (OS) Level == 50

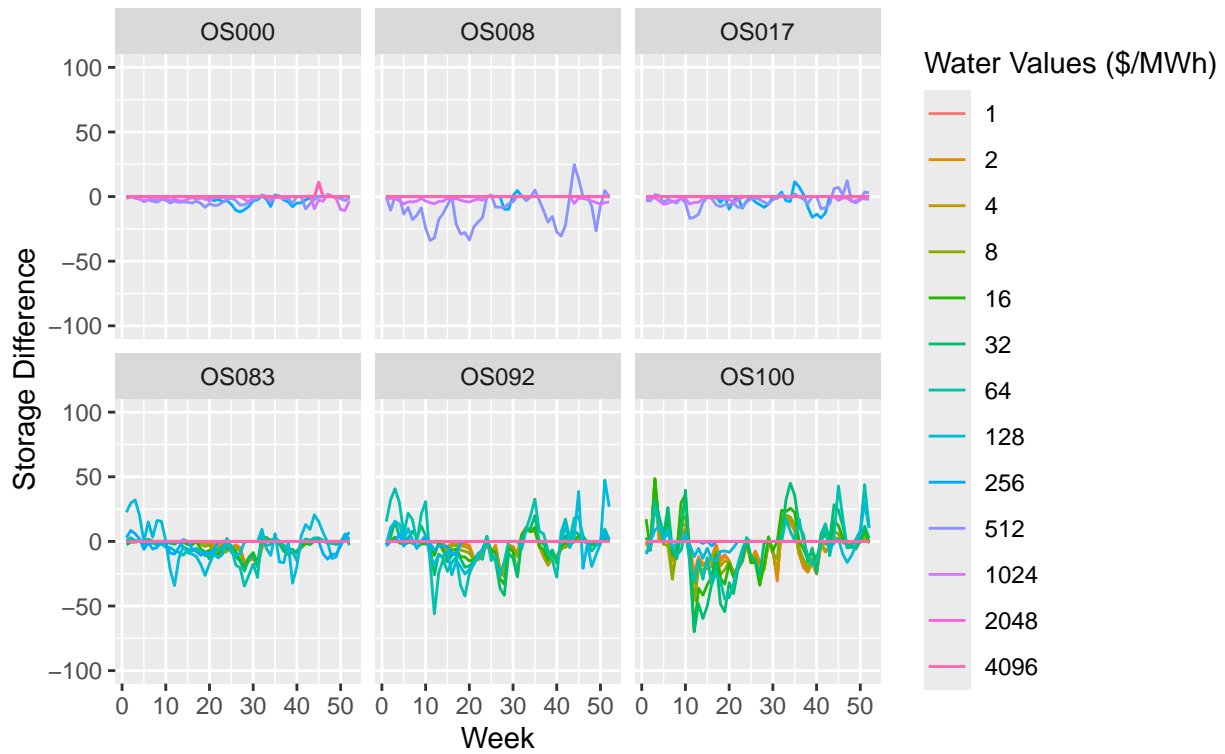


Manapouri Storage Difference  
Faceted by Inner Other Storage Levels ( $25 \leq OS \leq 75$ )



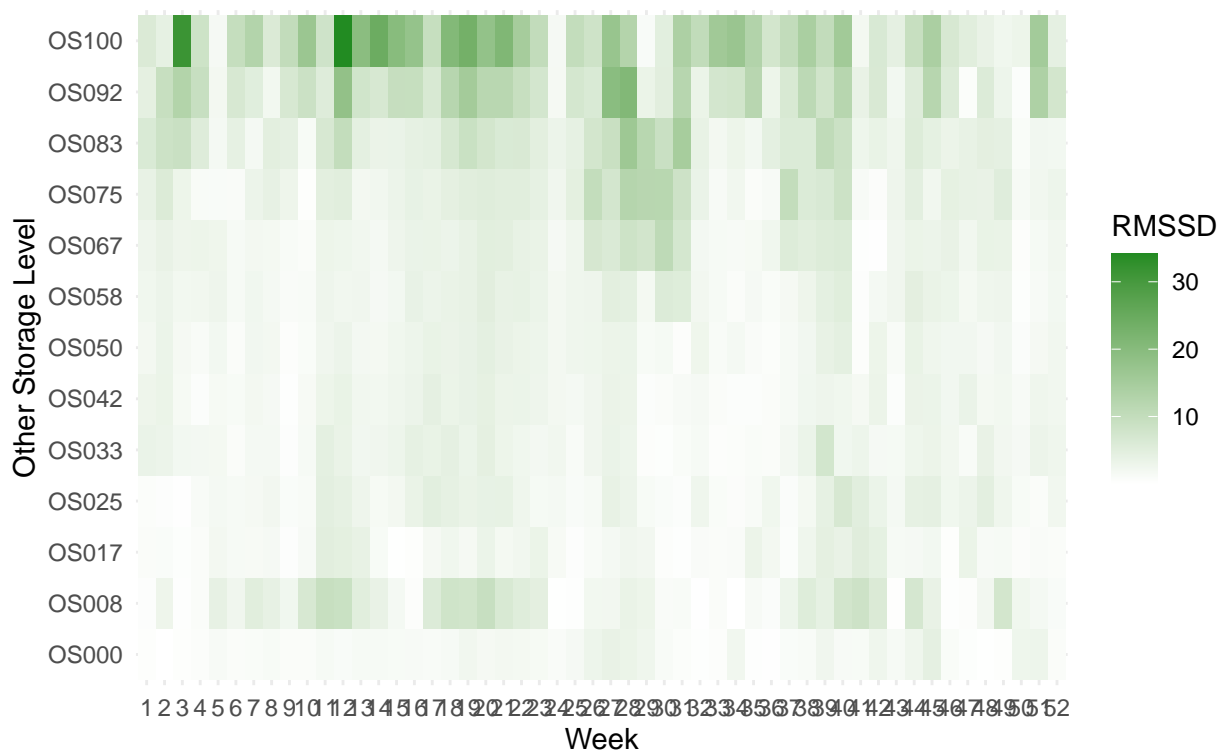
## Manapouri Storage Difference

Faceted by Outer Other Storage Levels (OS < 25 | OS > 75)

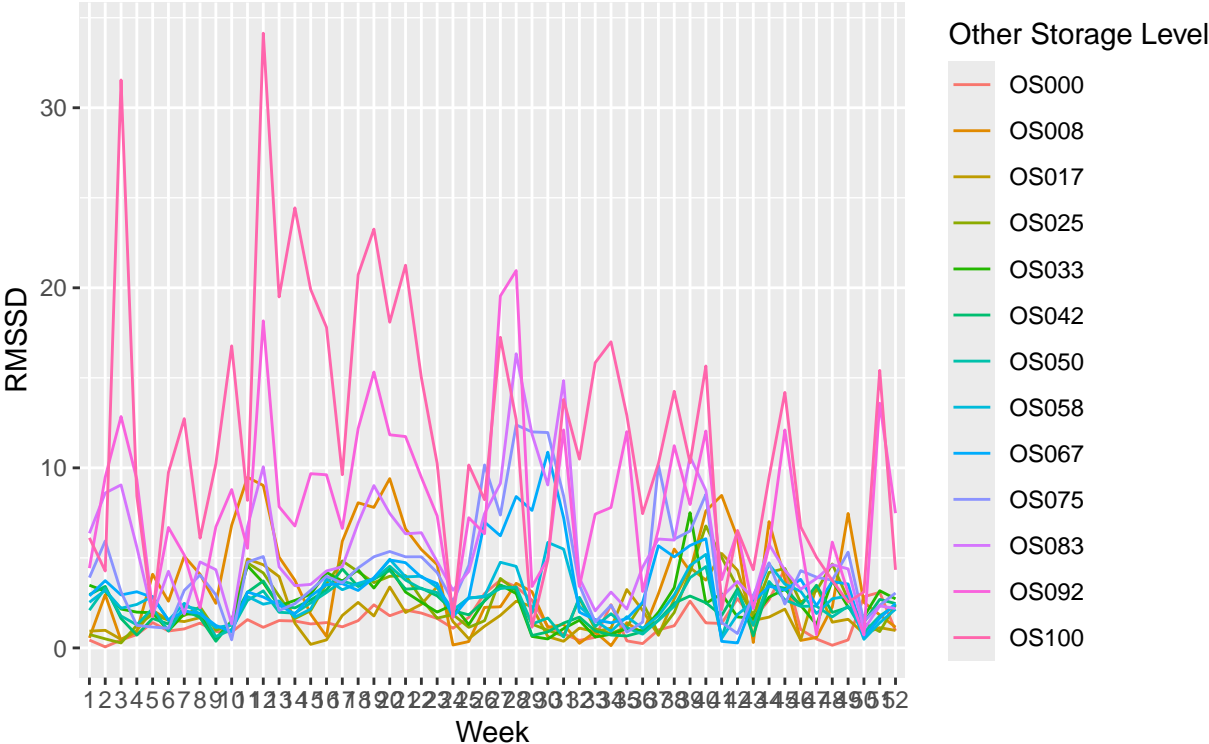


## Manapouri Root Mean Squared Storage Difference (RMSSD)

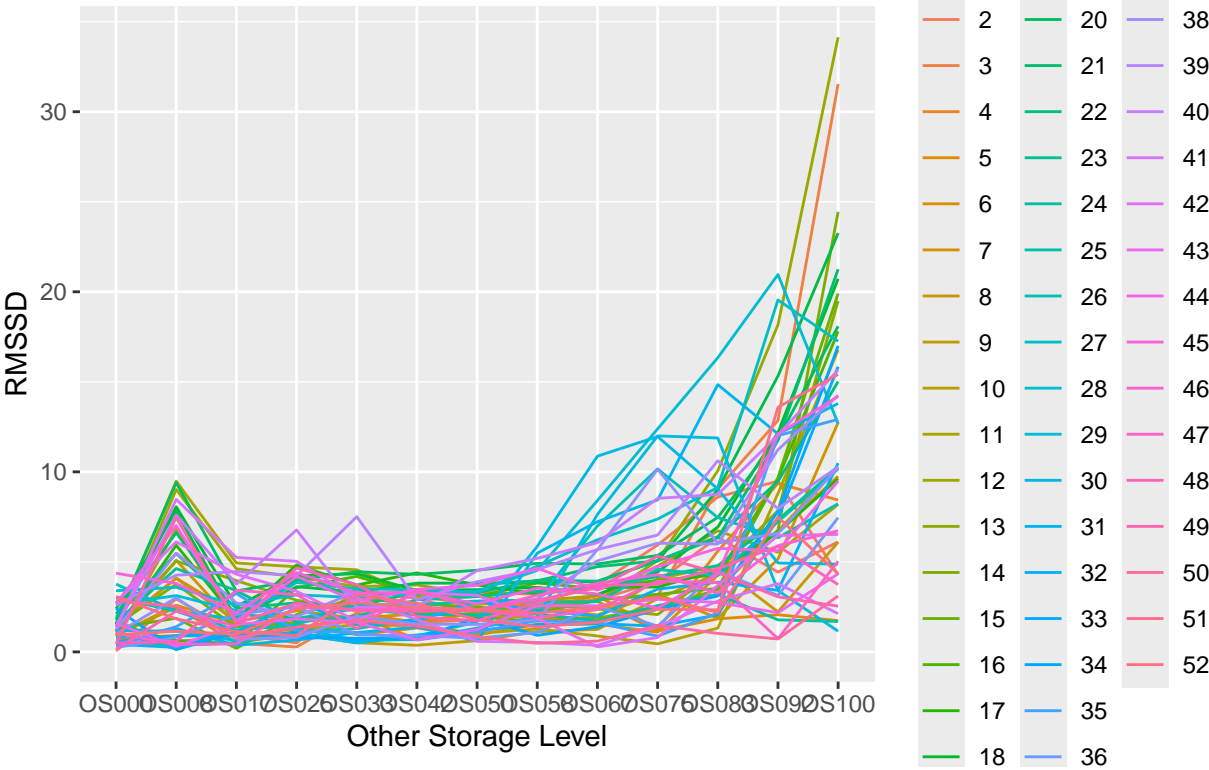
by Week and Other Storage Level



Manapouri Root Mean Squared Storage Difference (RMSSD)  
by Week



Manapouri Root Mean Squared Storage Difference (RMSSD)  
by Other Storage Level



```
## # A tibble: 1 x 1
##   rmssd
##   <dbl>
## 1  5.75
```