4_Vis_IS_rec5

Kurt Ingeman

6/27/2021

create domains (Ocean, Human, Predator)

ESU

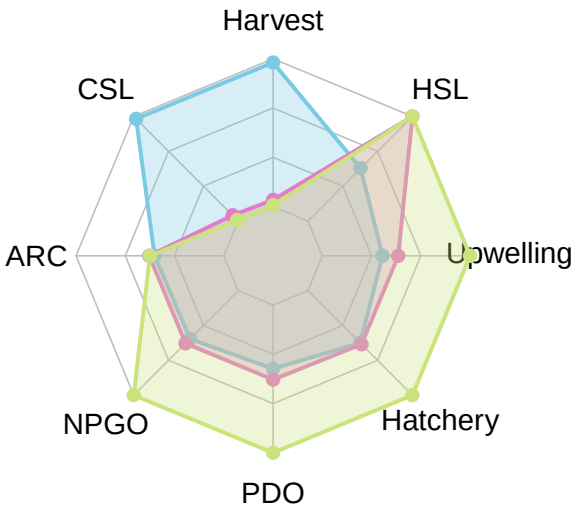
2a. What variables are in the top models? In what frequency?

To do that right, we need to actually through ALL the vars in the SMAP hopper, not just the top ones

But I can get an highest and average rank model that each var shows up in

```
rec5_spider <- data.frame(rbind(rep(1,8), rep(0,8),
                                rec5_mods$rank_mod, rec5_mods$prop_mod, rec5_mods$scale_mod
                                  ))
colnames(rec5_spider) <- rec5_mods$FP

trans.pal <- c("#7BCAE44D", "#E47BCA4D", "#CAE47B4D")
pal <- c("#7BCAE4", "#E47BCA", "#CAE47B")

# op <- par(mar = c(1, 1, 1, 1))
# par(mar = c(1, 0, 1, 5))

radarchart(rec5_spider, axistype=0,
           #custom polygon
           pcol=pal, pfcol=trans.pal,  plwd=2, plty=1, seg = 3,
           #custom the grid
           cglcol="grey", cglty=1, cglwd=0.8,
           #custom labels
           vlcex=.9, vlabels = c("Harvest", "CSL", "ARC", "NPGO", "PDO", "Hatchery", "Upwelling", "HSL"
           title="What variables are found in top models?")
```

What variables are found in top models?

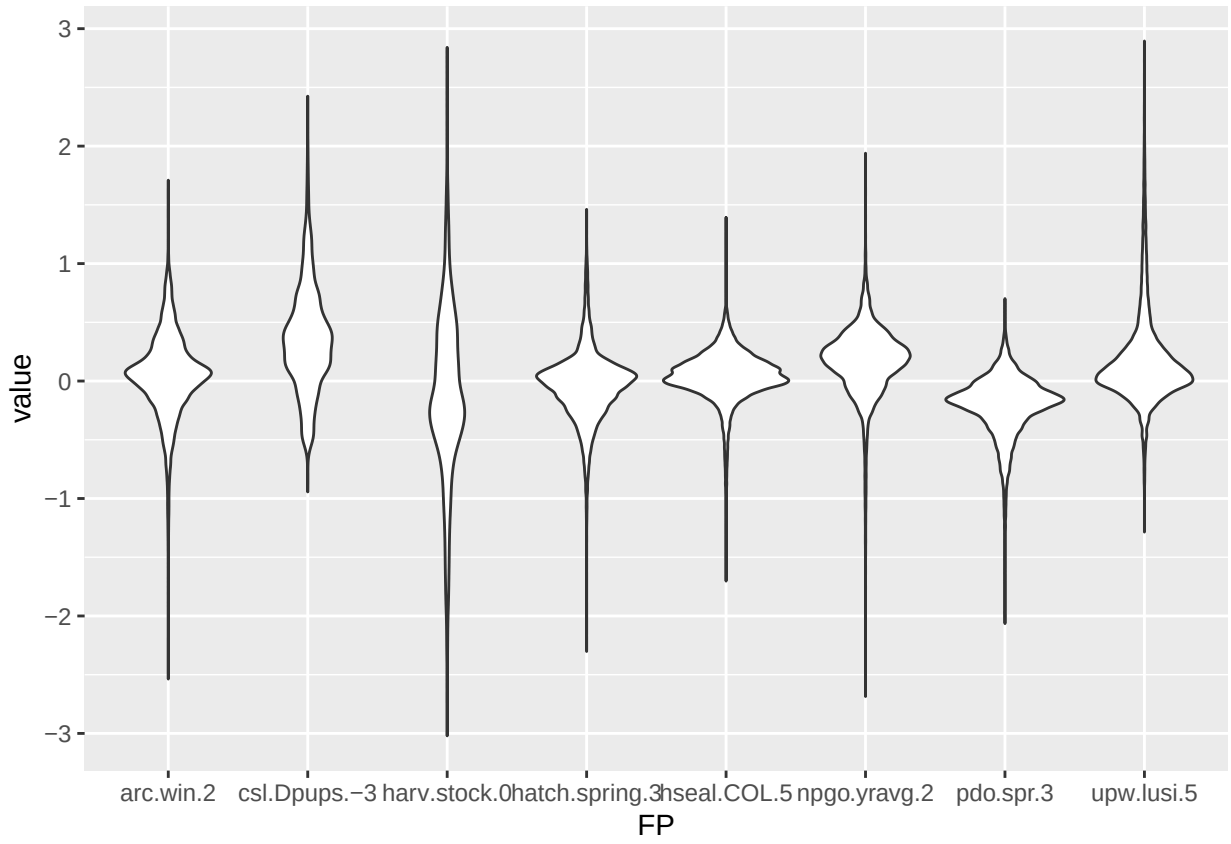



```
# legend(x=.9, y=.8, legend = c("Ave Rank", "No. Models", "Highest Rank"), bty = "n", pch=20 , col=pal,


# par(op)
```

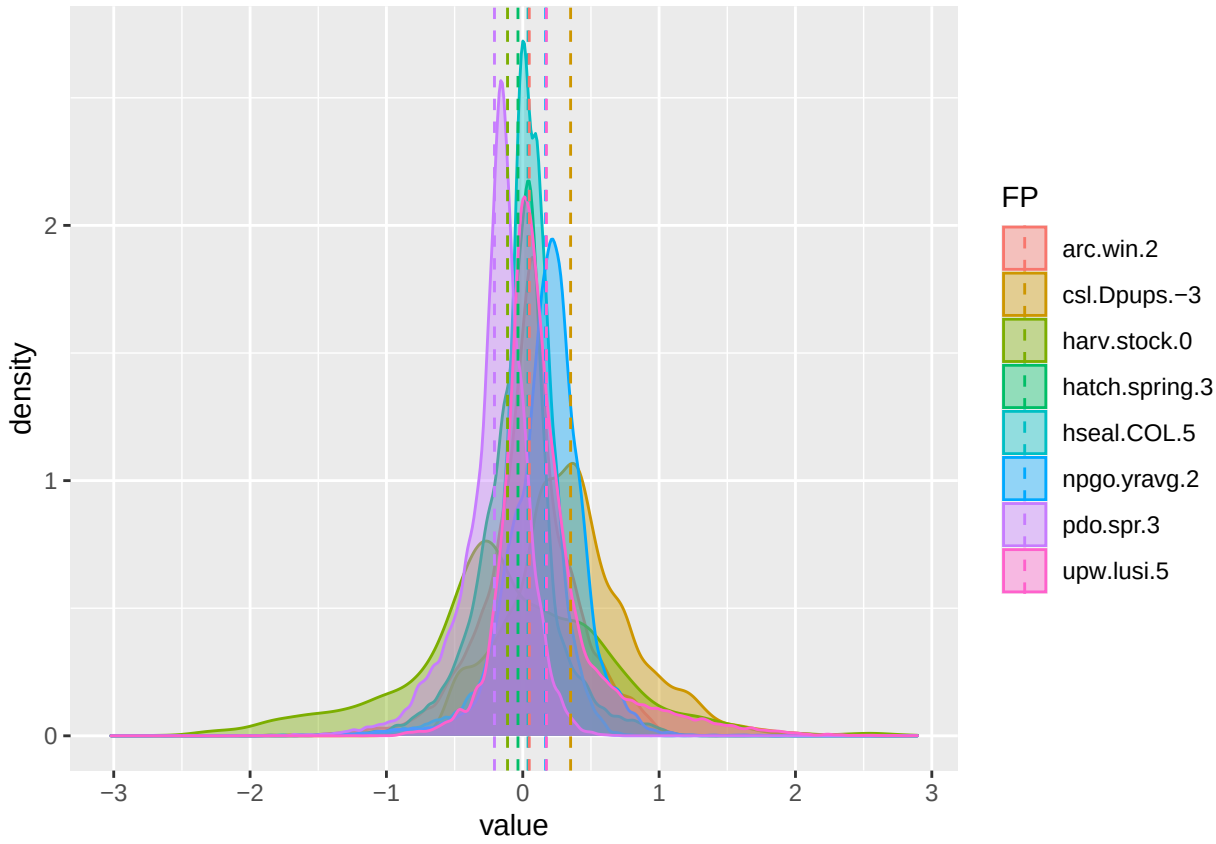
2b. How do predator interaction strengths compared to variables from other domains (ocean, human)?

Distribution of partial derivatives, averaged across stocks, and across years, for each var

```
rec5_ESU <-  rec5_ESU %>%
  filter(!grepl("rec5", FP)) %>%
  group_by(FP) %>%
  mutate(mu = mean(value, na.rm=TRUE)) %>%
  ungroup()

ggplot(rec5_ESU, aes(x = FP, y = value)) +
  geom_violin()
```




```
ggplot(rec5_ESU, aes(x = value, color = FP, fill = FP)) +
  geom_density(alpha = 0.4) +
  geom_vline(aes(xintercept = mu, color = FP),
             linetype = "dashed")
```

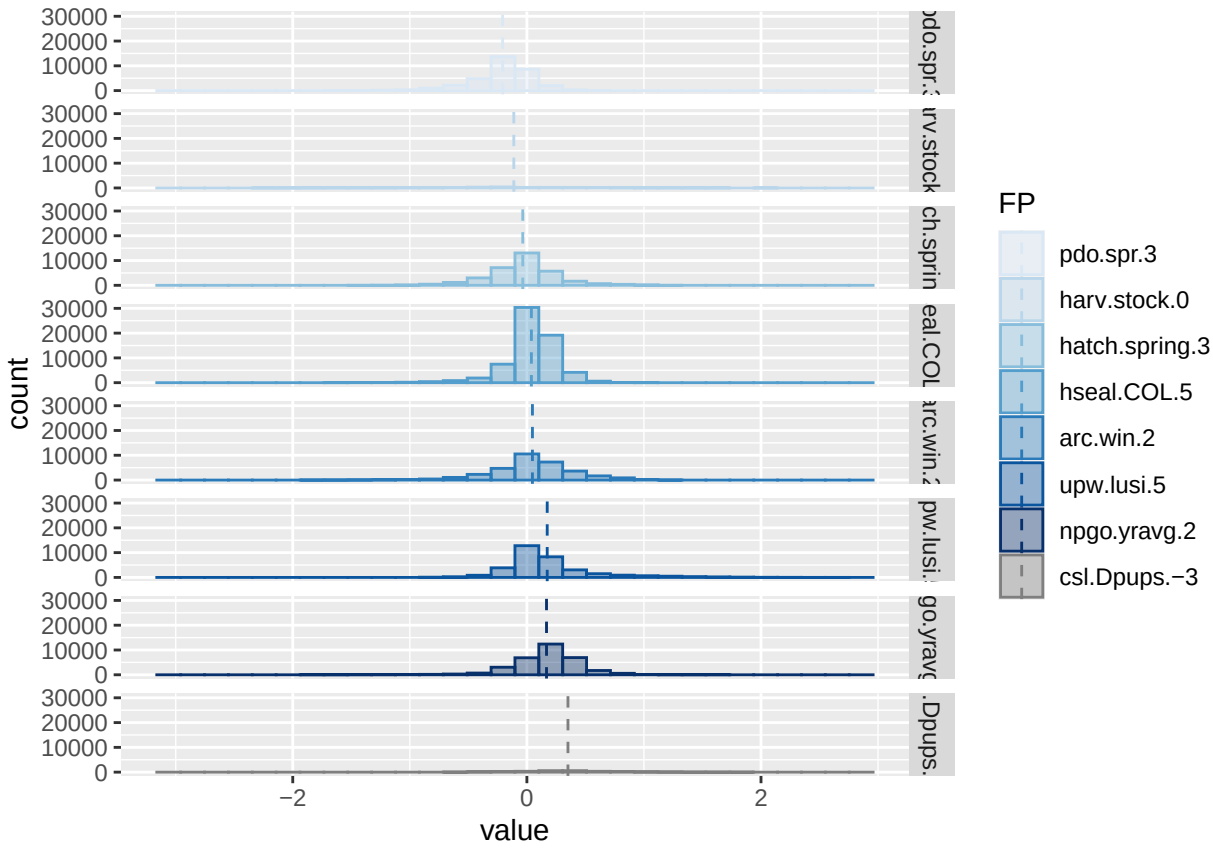



```
# Tough to see differences in this style
unique(rec5_ESU$FP)
```

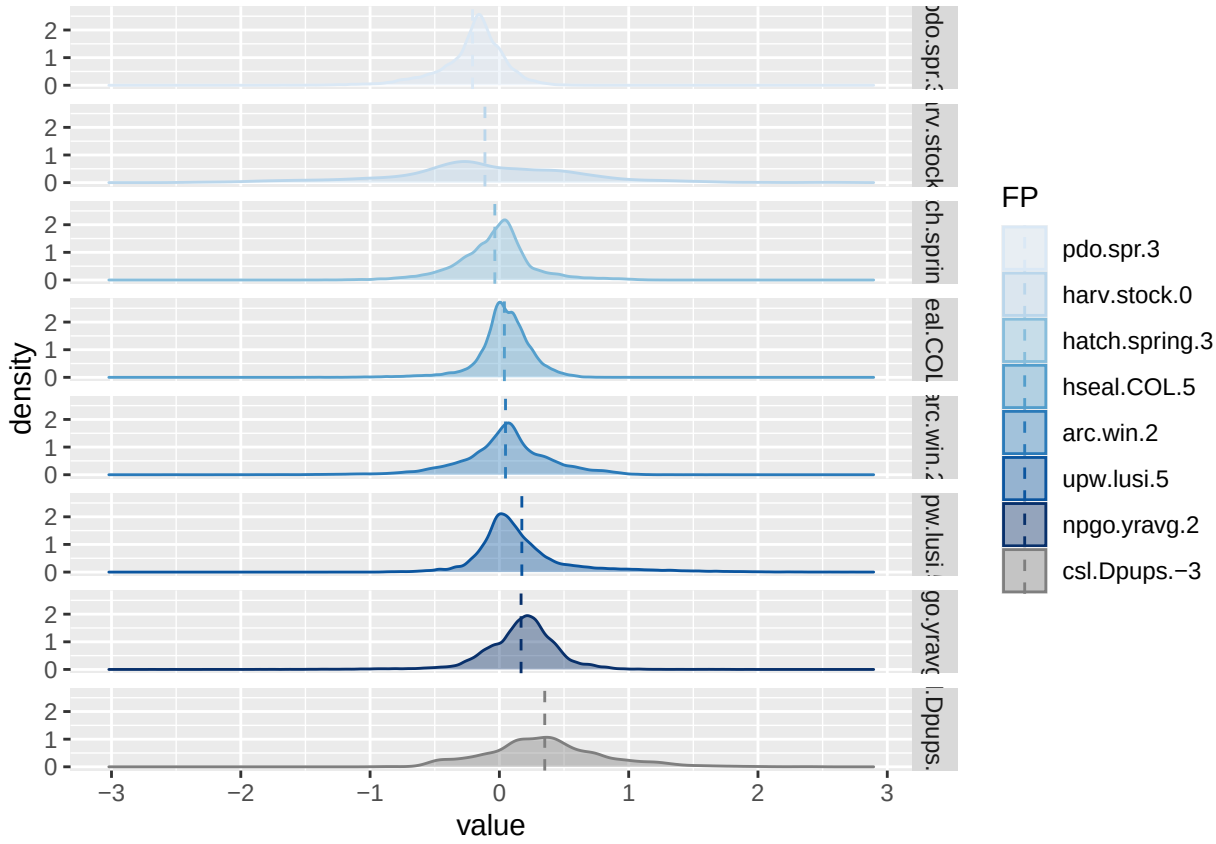
```
## [1] "hatch.spring.3" "hseal.COL.5"    "npgo.yravg.2"   "pdo.spr.3"
## [5] "upw.lusi.5"     "arc.win.2"      "csl.Dpups.-3"   "harv.stock.0"
```

```
rec5_ESU$FP = factor(rec5_ESU$FP, levels=c("pdo.spr.3", "harv.stock.0", 'hatch.spring.3', 'hseal.COL.5'

ggplot(rec5_ESU, aes(x = value, color = FP, fill = FP)) +
  geom_histogram(position = "identity", alpha = 0.4) +
  scale_color_manual(values = colorRampPalette(brewer.pal(9, "Blues"))(8)[2:9]) +
  scale_fill_manual(values = colorRampPalette(brewer.pal(9, "Blues"))(8)[2:9]) +
    geom_vline(aes(xintercept = mu, color = FP),
               linetype = "dashed")+
  facet_grid(FP ~ .)
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```




```
ggplot(rec5_ESU, aes(x = value, color = FP, fill = FP)) +
  geom_density(alpha = 0.4) +
  scale_color_manual(values = colorRampPalette(brewer.pal(9, "Blues"))(8)[2:9]) +
  scale_fill_manual(values = colorRampPalette(brewer.pal(9, "Blues"))(8)[2:9]) +
    geom_vline(aes(xintercept = mu, color = FP),
               linetype = "dashed")+
  facet_grid(FP ~ .)
```

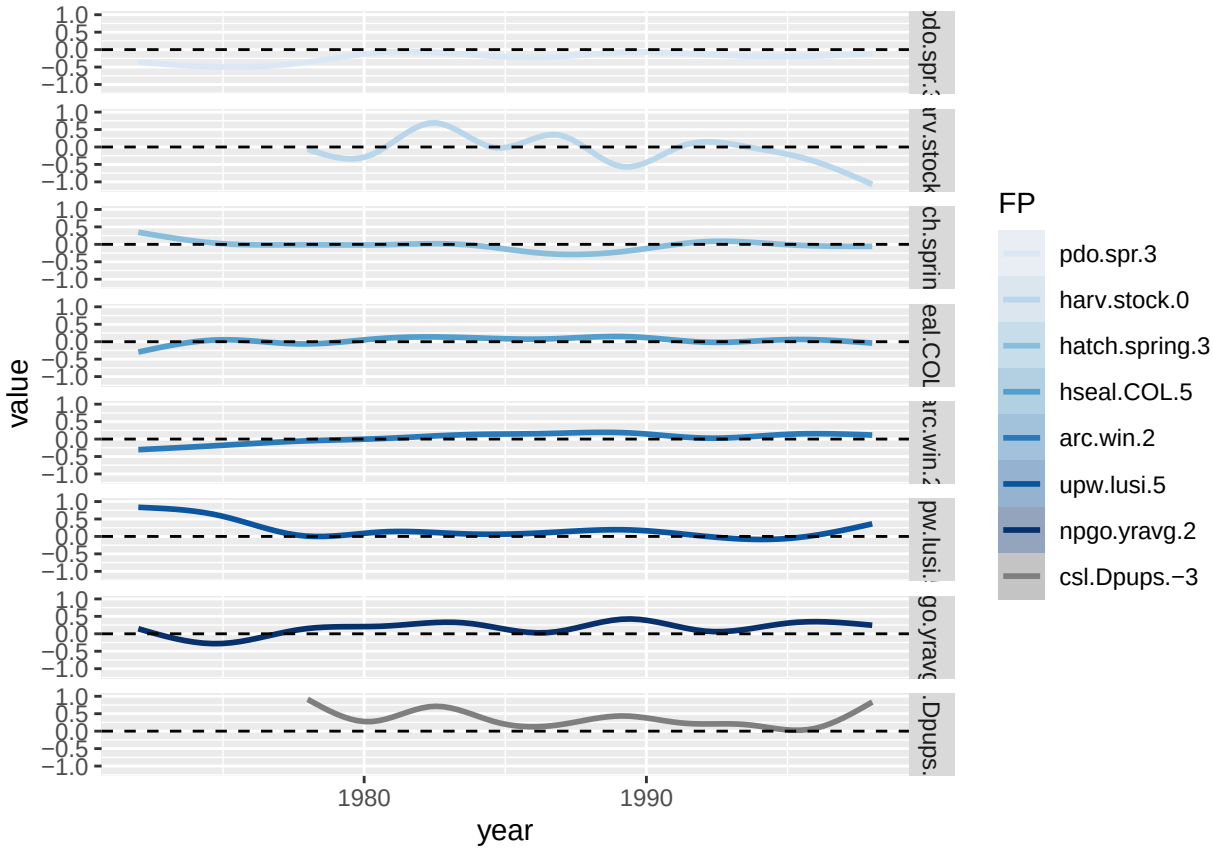


3. How do predator interaction strengths (and vars from other domains) vary through time?

Times series of partial Derivatives, averaged across stocks, for each var

```
ggplot(rec5_ESU, aes(x = year, y = value, fill = FP, color = FP)) +
  geom_smooth() +
  scale_fill_manual(values = colorRampPalette(brewer.pal(9, "Blues"))(8)[2:9]) +
  scale_color_manual(values = colorRampPalette(brewer.pal(9, "Blues"))(8)[2:9]) +
    geom_hline(aes(yintercept = 0),
               linetype = "dashed") +
  facet_grid(FP ~ .)
```

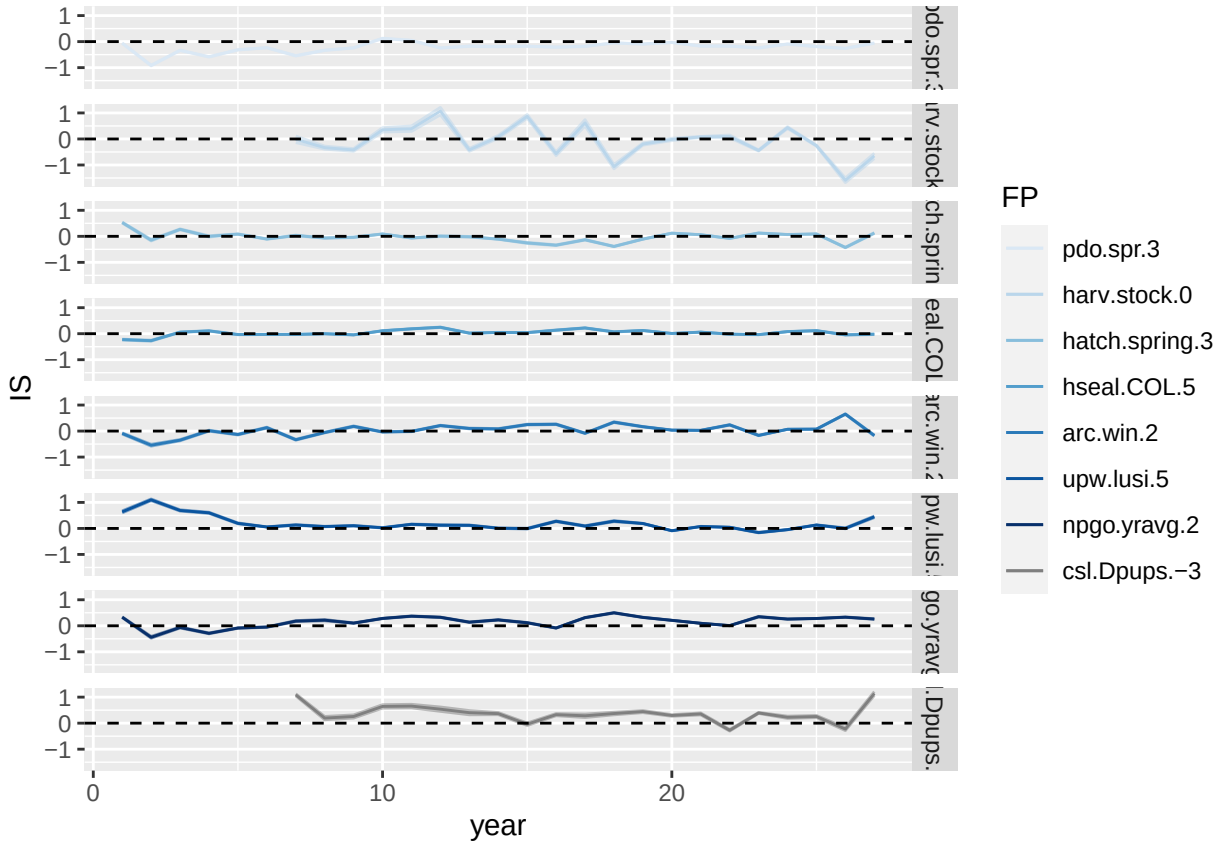
```
## `geom_smooth()` using method = 'gam' and formula 'y ~ s(x, bs = "cs")'
```



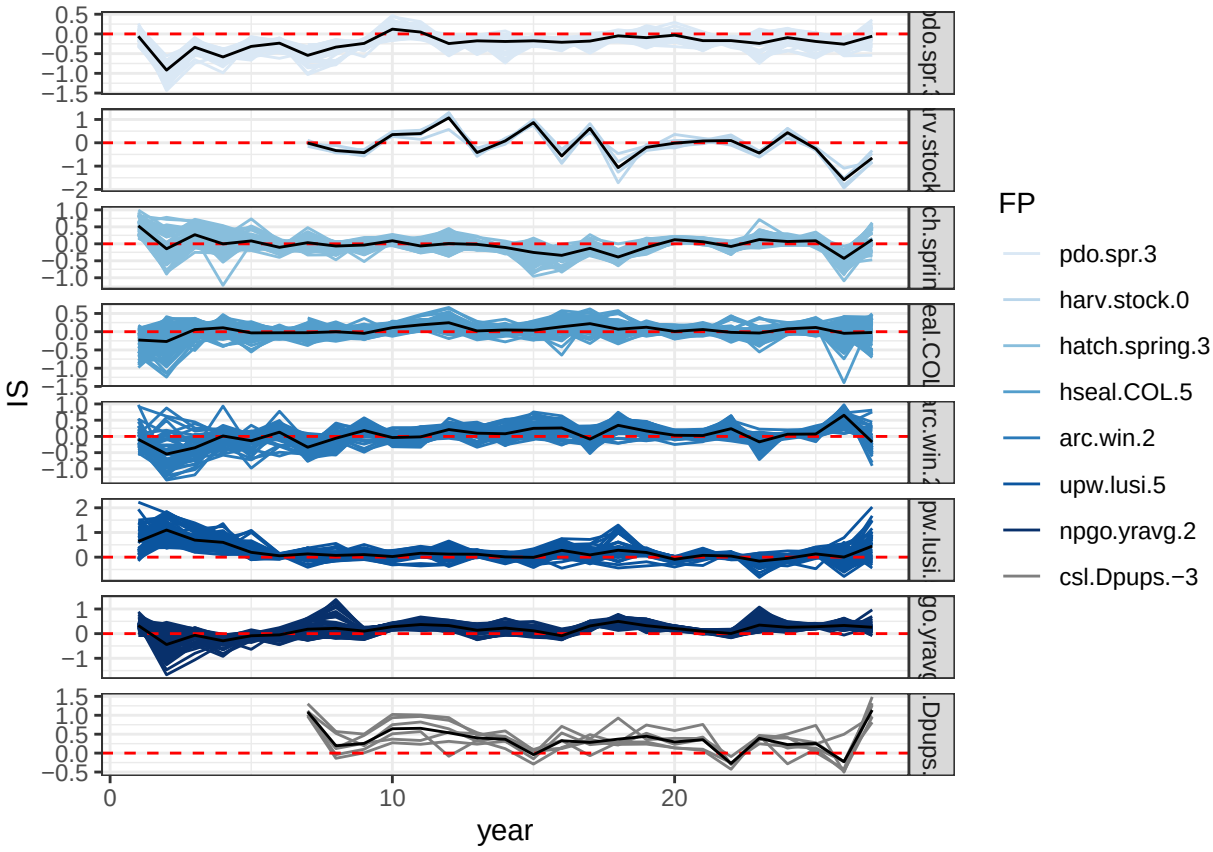

```
rec5_ESU_ts <- rec5_ESU %>%
  filter(year > 1957) %>%
  filter(year < 2016) %>%
  mutate(year = factor(year)) %>%
  group_by(year, FP) %>%
  summarise(IS = mean(value, na.rm = TRUE),
            sd = sd(value, na.rm = TRUE),
            n = n()) %>%
  mutate(se = sd / sqrt(n),
         lower = IS - qt(1 - (0.05 / 2), n - 1) * se,
         upper = IS + qt(1 - (0.05 / 2), n - 1) * se) %>%
  mutate(year = as.integer(year)) %>%
ungroup() %>% ungroup()
```

```
## `summarise()` has grouped output by 'year'. You can override using the `.groups` argument.
```

```
ggplot(rec5_ESU_ts, aes(x = year, color = FP, fill = FP)) +
  geom_line(aes(y = IS)) +
  geom_line(aes(y = upper), alpha = 0.5) +
  geom_line(aes(y = lower), alpha = 0.5) +
  geom_hline(aes(yintercept = 0),
             linetype = "dashed") +
    scale_fill_manual(values = colorRampPalette(brewer.pal(9, "Blues"))(8)[2:9]) +
  scale_color_manual(values = colorRampPalette(brewer.pal(9, "Blues"))(8)[2:9]) +
     facet_grid(FP ~ .)
```




```
rec5_ESU_lines <- rec5_ESU %>%
  filter(year > 1957) %>%
  filter(year < 2016) %>%
  mutate(year = factor(year)) %>%
  group_by(year, FP, embedding) %>%
  mutate(IS = mean(value)) %>%
  mutate(year = as.integer(year))


ggplot() +
  geom_line(rec5_ESU_lines, mapping = aes(x=year, y=IS, col=FP, group=embedding)) +
  geom_hline(rec5_ESU_lines, mapping = aes(yintercept = 0),linetype = "dashed", color = "red") +
  scale_fill_manual(values = colorRampPalette(brewer.pal(9, "Blues"))(8)[2:9]) +
  scale_color_manual(values = colorRampPalette(brewer.pal(9, "Blues"))(8)[2:9]) +
  geom_line(rec5_ESU_ts, mapping = aes(x=year, y=IS), color = "black") +
  facet_grid(FP ~ ., scales = "free") +
  theme_bw()
```



IMN

2a. What variables are in the top models? In what frequency?

```
unique(rec5_IMN$FP)
```

```
##  [1] "rec5n"               "rec5n_-2"            "harv.ORWAsport.5"
##  [4] "hatch.total.3"       "hseal.COL.5"         "orca.SRKWdeathsJKL.5"
##  [7] "pdo.sum.2"           "upw.tumi.2"          "rec5n_-6"
## [10] "arc.sum.2"           "npgo.yrsum.2"        "flow.peak.3"
## [13] "rec5n_-1"            "rec5n_-7"            "rec5n_-3"
## [16] "rec5n_-5"
```

```
unique(rec5_IMN$embedding) # 178
```

```
##   [1]   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18
##  [19]  19  20  21  22  23  24  25  26  27  28  29  30  31  32  33  34  35  36
##  [37]  37  38  39  40  41  42  43  44  45  46  47  48  49  50  51  52  53  54
##  [55]  55  56  57  58  59  60  61  62  63  64  65  66  67  68  69  70  71  72
##  [73]  73  74  75  76  77  78  79  80  81  82  83  84  85  86  87  88  89  90
##  [91]  91  92  93  94  95  96  97  98  99 100 101 102 103 104 105 106 107 108
## [109] 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126
## [127] 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144
## [145] 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162
## [163] 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178
```

FP	best_mod	prop_mod	rank_mod
arc.sum.2	2	0.5280899	0.4851781
flow.peak.3	9	0.3707865	0.4899557
harv.ORWAsport.5	1	0.9831461	0.4986838
hatch.total.3	1	0.4325843	0.4876696
hseal.COL.5	1	1.0000000	0.5028090
npgo.yrsum.2	2	0.5393258	0.4945576
orca.SRKWdeathsJKL.5	1	0.4101124	0.4847622
pdo.sum.2	1	0.5112360	0.4827757
upw.tumi.2	1	0.4550562	0.4812041

```
em_rec5_IMN <- as.numeric(length(unique(rec5_IMN$embedding)))

rec5_mods <- rec5_IMN %>%
  group_by(embedding, FP) %>%
  summarise() %>%
  group_by(FP) %>%
  mutate(
    best_mod = min(embedding), # lowest number (highest rank) model
    scale_mod = 1 / best_mod, # above expressed as 0-1
    rank_mod = mean(embedding)/em_rec5_IMN , # average rank of model that that they are in
    total_num = length(embedding), # number of models that they are in
    prop_mod = total_num/em_rec5_IMN , # proportion of model that they are in
    weight = em_rec5_IMN -embedding, # reverse of rank
    integrated = sum(weight)/(em_rec5_IMN *(em_rec5_IMN+1) /2)) %>% # integrate rank and weight
  slice(1) %>%
  filter(!grepl("rec5", FP)) %>%
  ungroup()
```

```
## `summarise()` has grouped output by 'embedding'. You can override using the `.groups` argument.
```

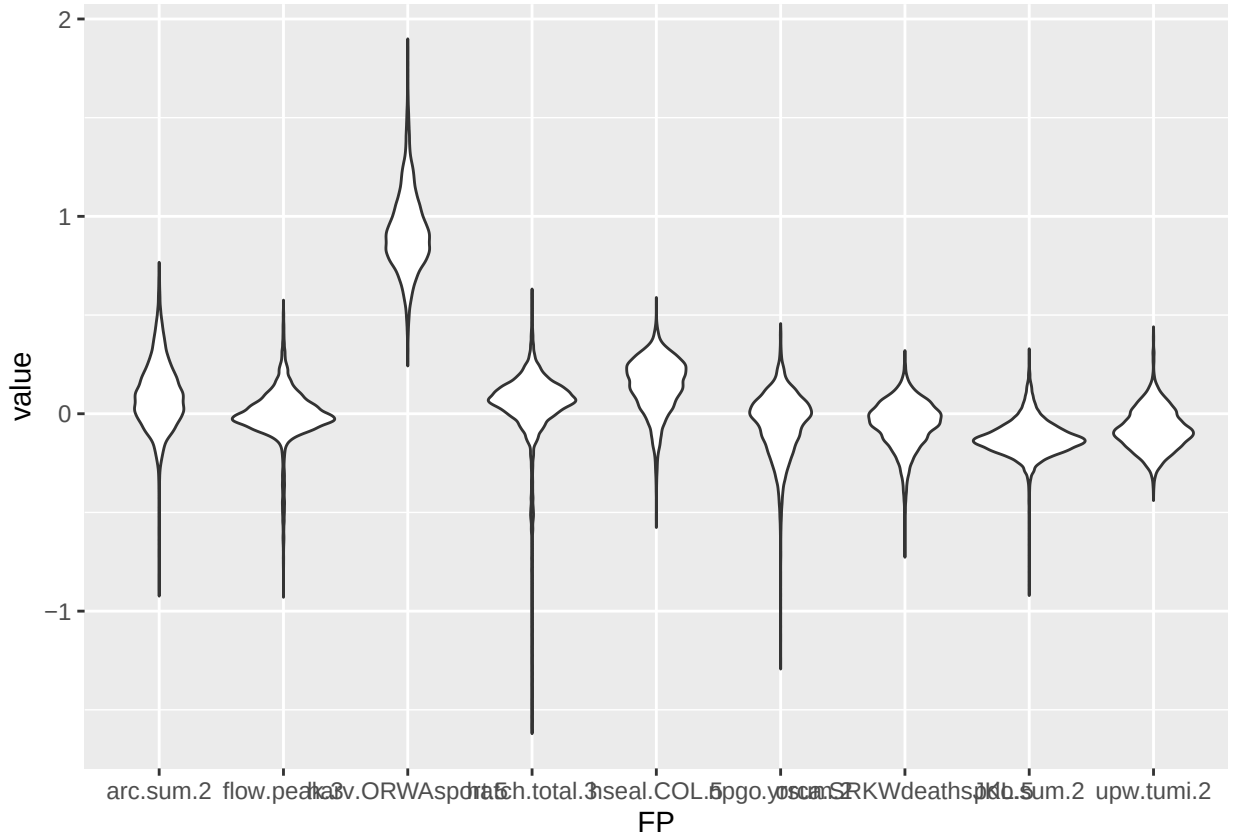
```
vars_IMN <- unique(rec5_mods$FP)

# Make a table instead

rec5_table <- rec5_mods %>%
  select(FP, best_mod, prop_mod, rank_mod)

rec5_table %>%
  kbl() %>%
  kable_classic_2(full_width = F)
```

2b. How do predator interaction strengths compared to variables from other domains (ocean, human)?

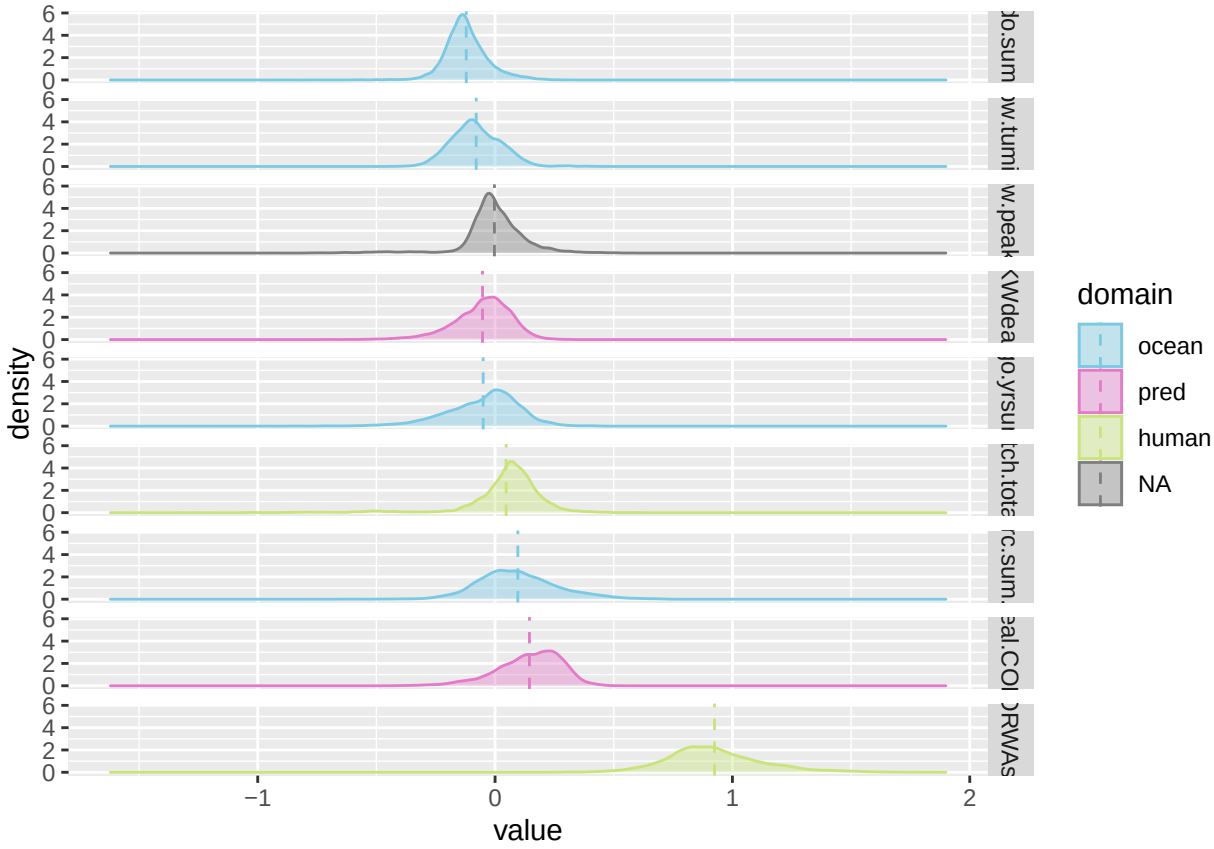
Distribution of partial derivatives, averaged across stocks, and across years, for each var

```
rec5_IMN<-  rec5_IMN  %>%
  filter(!grepl("rec5", FP)) %>%
  group_by(FP) %>%
  mutate(mu = mean(value, na.rm=TRUE)) %>%
  ungroup()
```

```
ggplot(rec5_IMN, aes(x = FP, y = value)) +
  geom_violin()
```




```
rec5_IMN$domain = factor(rec5_IMN$domain, levels = c( "ocean" , "pred", "human"))


rec5_IMN$FP = factor(rec5_IMN$FP,
                levels=c("pdo.sum.2",
                         'upw.tumi.2',
                         'flow.peak.3',
                        'orca.SRKWdeathsJKL.5',
                         "npgo.yrsum.2",
                          "hatch.total.3",
                        "arc.sum.2",
                        "hseal.COL.5",
                       "harv.ORWAsport.5"
                        ))

ggplot(rec5_IMN, aes(x = value, color = domain, fill = domain)) +
  geom_density(alpha = 0.4) +
  scale_color_manual(values = pal) +
  scale_fill_manual(values = pal) +
    geom_vline(aes(xintercept = mu, color = domain),
               linetype = "dashed") +
  facet_grid(FP ~ .)
```

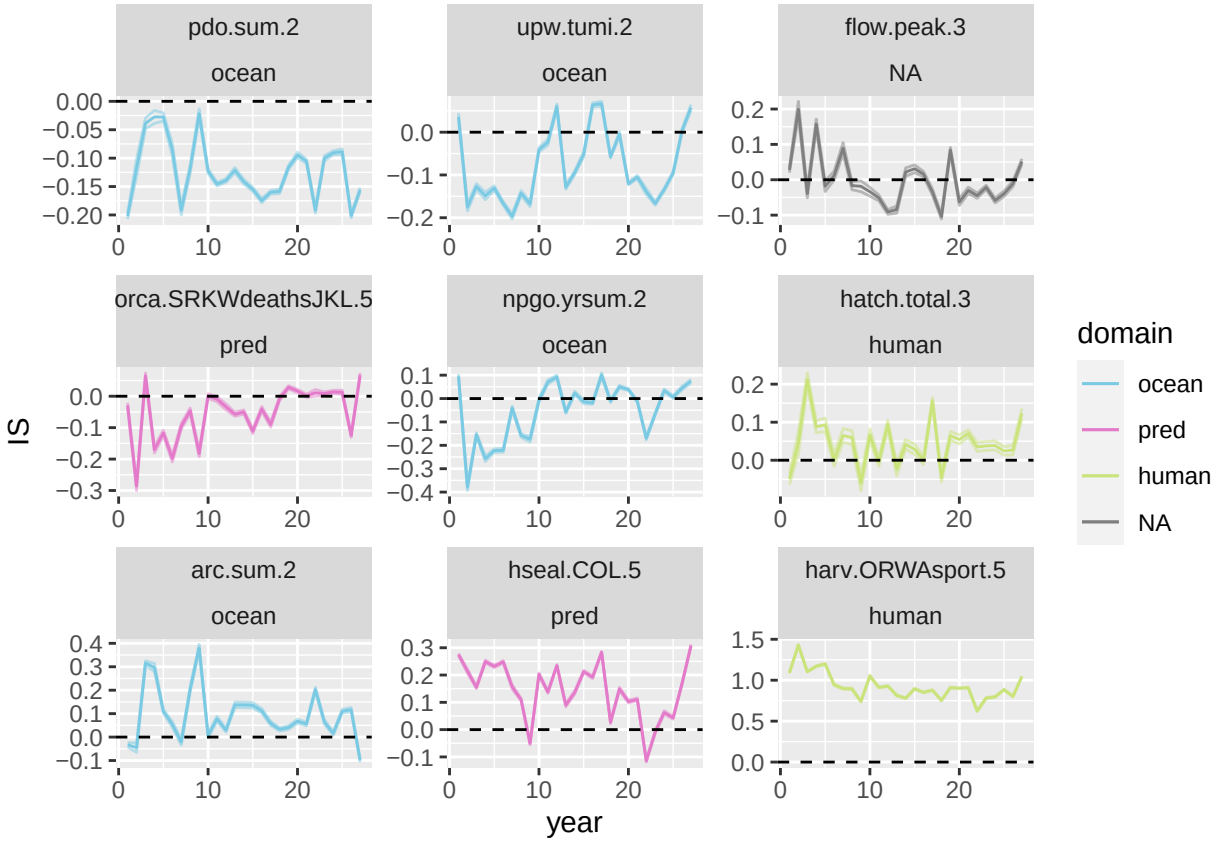


3. How do predator interaction strengths (and vars from other domains) vary through time?

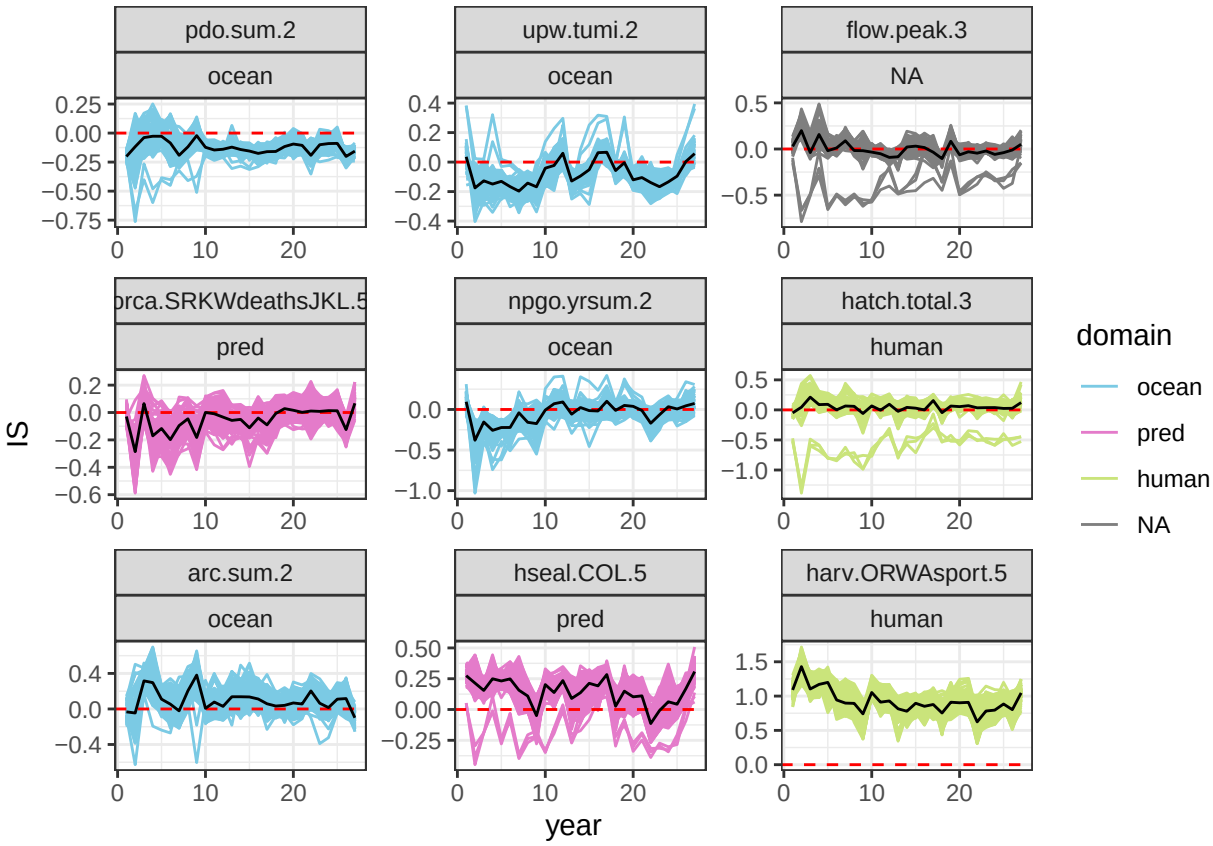
Times series of partial Derivatives, averaged across stocks, for each var

```
rec5_IMN_ts <- rec5_IMN %>%
  filter(year > 1957) %>%
  filter(year < 2016) %>%
  mutate(year = factor(year)) %>%
  group_by(year, FP) %>%
  mutate(IS = mean(value, na.rm = TRUE),
            sd = sd(value, na.rm = TRUE),
            n = n()) %>%
  mutate(se = sd / sqrt(n),
         lower = IS - qt(1 - (0.05 / 2), n - 1) * se,
         upper = IS + qt(1 - (0.05 / 2), n - 1) * se) %>%
  mutate(year = as.integer(year))

ggplot(rec5_IMN_ts, aes(x = year, color = domain, fill = domain)) +
  geom_line(aes(y = IS)) +
  geom_line(aes(y = upper), alpha = 0.5) +
  geom_line(aes(y = lower), alpha = 0.5) +
  geom_hline(aes(yintercept = 0),
             linetype = "dashed") +
    scale_fill_manual(values = pal) +
```

```
  scale_color_manual(values = pal) +
     facet_wrap(~ FP + domain, scales = "free")
```




```
rec5_IMN_lines <- rec5_IMN %>%
  filter(year > 1957) %>%
  filter(year < 2016) %>%
  mutate(year = factor(year)) %>%
  group_by(year, FP, embedding) %>%
  mutate(IS = mean(value)) %>%
  mutate(year = as.integer(year))


ggplot() +
  geom_line(rec5_IMN_lines, mapping = aes(x=year, y=IS, col=domain, group=embedding)) +
  scale_fill_manual(values = pal) +
  scale_color_manual(values = pal) +
  geom_hline(rec5_IMN_lines, mapping = aes(yintercept = 0),linetype = "dashed", color = "red") +
  geom_line(rec5_IMN_ts, mapping = aes(x=year, y=IS), color = "black") +
  facet_wrap(FP + domain ~ ., scales = "free") +
  theme_bw()
```



MFS

```
unique(rec5_MFS$FP)
```

```
##  [1] "rec5n"       "arc.win.2"   "harv.NBC.5"  "hatch.WA.1"  "hseal.COL.5"
##  [6] "pdo.spr.2"   "upw.lusi.4"  "npgo.sum.2"  "rec5n_-2"    "rec5n_-5"
## [11] "rec5n_-6"    "rec5n_-3"    "rec5n_-4"    "rec5n_-1"
```

```
unique(rec5_MFS$embedding) # 89
```

```
##  [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
## [26] 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
## [51] 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75
## [76] 76 77 78 79 80 81 82 83 84 85 86 87 88 89
```

```
em_rec5_MFS <- as.numeric(length(unique(rec5_MFS$embedding)))

rec5_mods <- rec5_MFS %>%
  group_by(embedding, FP) %>%
  summarise() %>%
  group_by(FP) %>%
  mutate(
    best_mod = min(embedding), # lowest number (highest rank) model
    scale_mod = 1 / best_mod, # above expressed as 0-1
    rank_mod = mean(embedding)/em_rec5_MFS , # average rank of model that that they are in
    total_num = length(embedding), # number of models that they are in
    prop_mod = total_num/em_rec5_MFS , # proportion of model that they are in
```

FP	best_mod	prop_mod	rank_mod
arc.win.2	1	0.6966292	0.4838710
harv.NBC.5	1	0.2471910	0.4862104
hatch.WA.1	1	0.4719101	0.5002675
hseal.COL.5	1	1.0000000	0.5056180
npgo.sum.2	2	0.1348315	0.5140449
pdo.spr.2	1	0.5280899	0.4747789
upw.lusi.4	1	0.4157303	0.5657455

```
    weight = em_rec5_MFS -embedding, # reverse of rank
    integrated = sum(weight)/(em_rec5_MFS *(em_rec5_MFS+1) /2)) %>% # integrate rank and weight
  slice(1) %>%
  filter(!grepl("rec5", FP)) %>%
  ungroup()
```

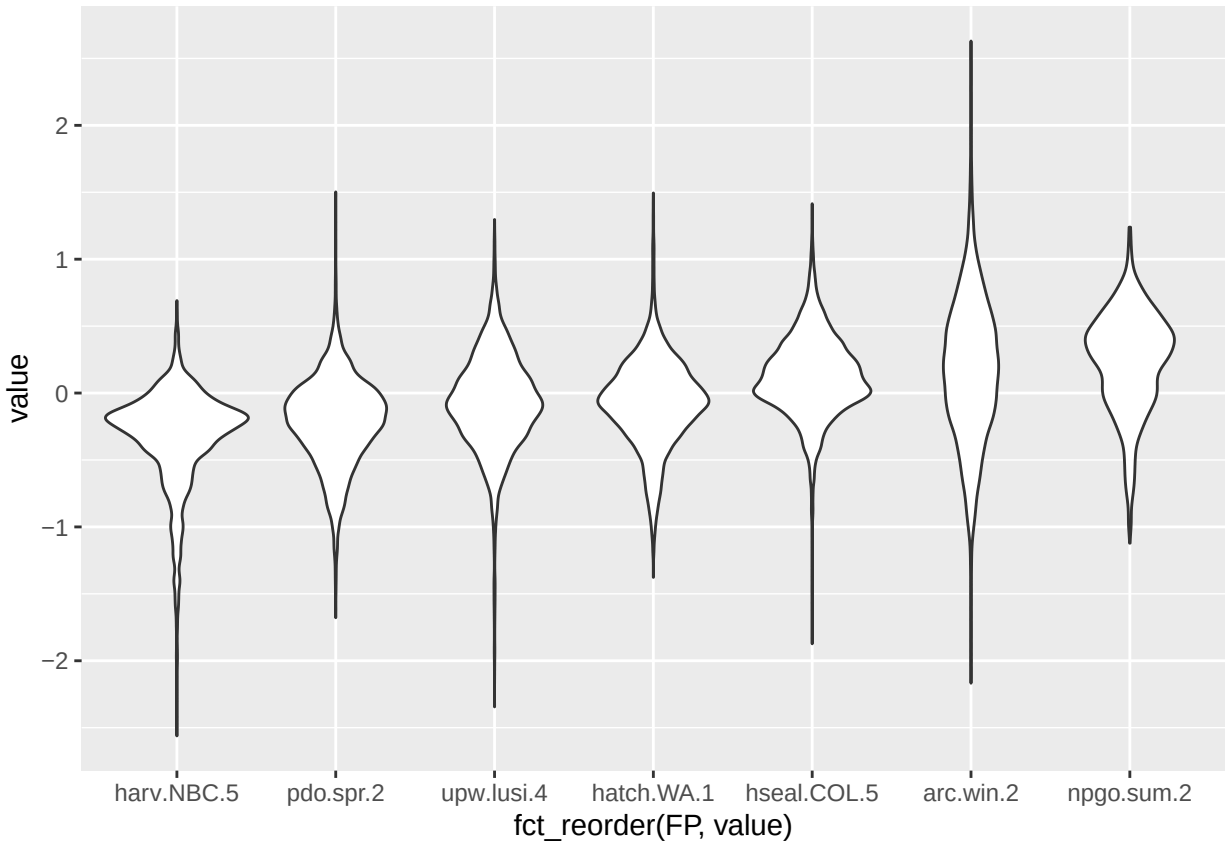
```
## `summarise()` has grouped output by 'embedding'. You can override using the `.groups` argument.
```

```
vars_MFS <- unique(rec5_mods$FP)

# Make a table instead

rec5_table <- rec5_mods %>%
  select(FP, best_mod, prop_mod, rank_mod)

rec5_table %>%
  kbl() %>%
  kable_classic_2(full_width = F)
```

2b. How do predator interaction strengths compared to variables from other domains (ocean, human)?

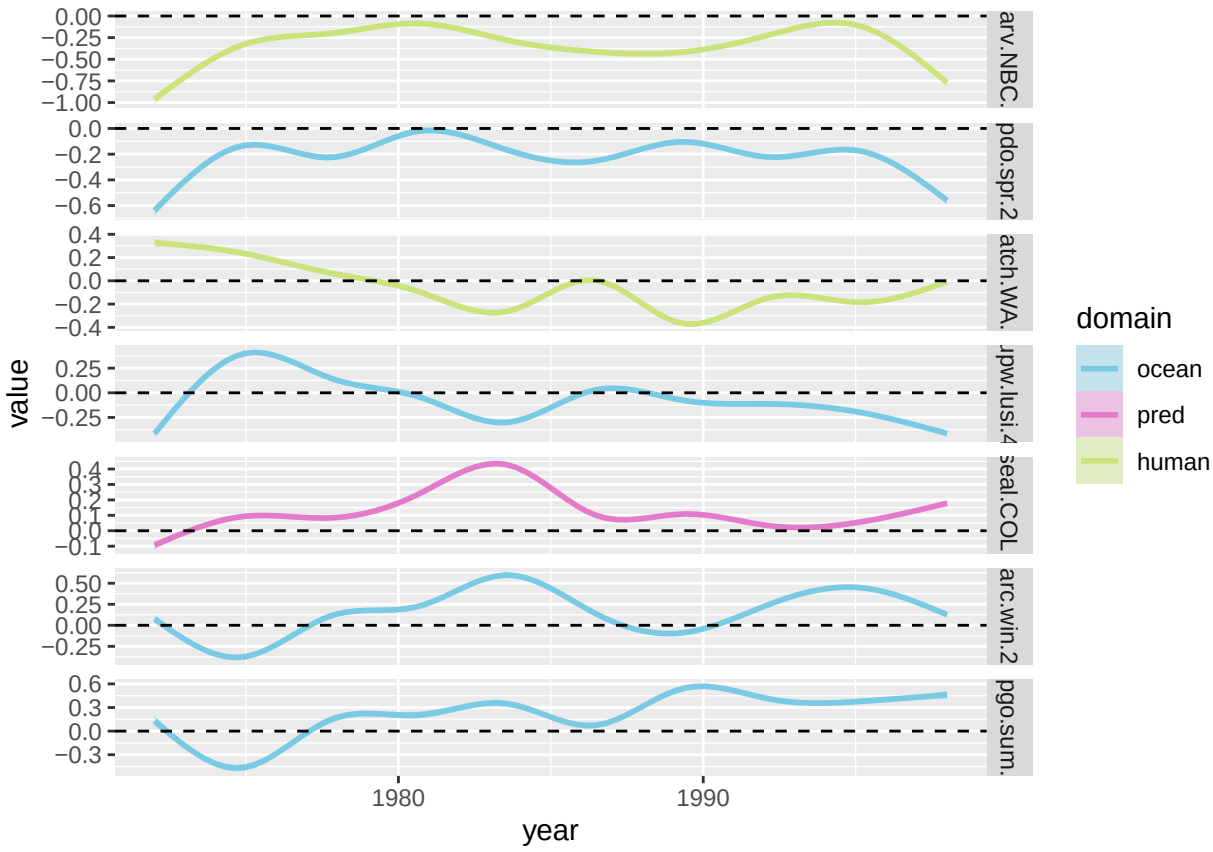
Partial Derivatives, averaged across stocks, and across years, for each

```
rec5_MFS<-  rec5_MFS  %>%
  filter(!grepl("rec5", FP)) %>%
  group_by(FP) %>%
  mutate(mu = mean(value, na.rm=TRUE)) %>%
  arrange(mu) %>%
  ungroup()

vars_MFS <- rec5_MFS %>%
  arrange(mu) %>%
  select(FP) %>%
  unique()

ggplot(rec5_MFS, aes(x = fct_reorder(FP, value), y = value)) +
  geom_violin()
```

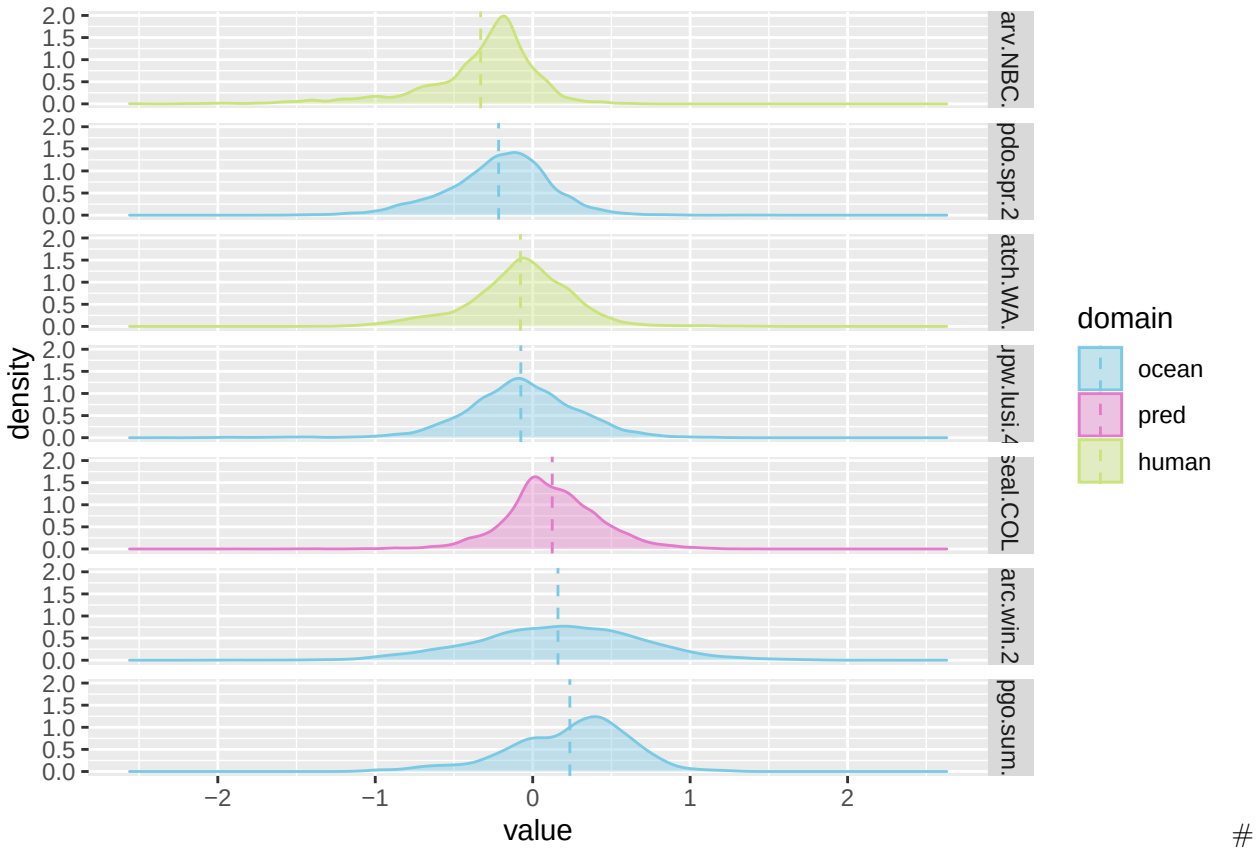



```
rec5_MFS$domain = factor(rec5_MFS$domain, levels = c( "ocean", "pred", "human"))

rec5_MFS$FP <- fct_reorder(rec5_MFS$FP, rec5_MFS$mu, min)


ggplot(rec5_MFS, aes(x = year, y = value, fill = domain, color = domain)) +
  geom_smooth() +
  scale_fill_manual(values = pal) +
  scale_color_manual(values = pal) +
    geom_hline(aes(yintercept = 0),
               linetype = "dashed") +
  facet_grid(FP ~ ., scales = "free")
```

```
## `geom_smooth()` using method = 'gam' and formula 'y ~ s(x, bs = "cs")'
```



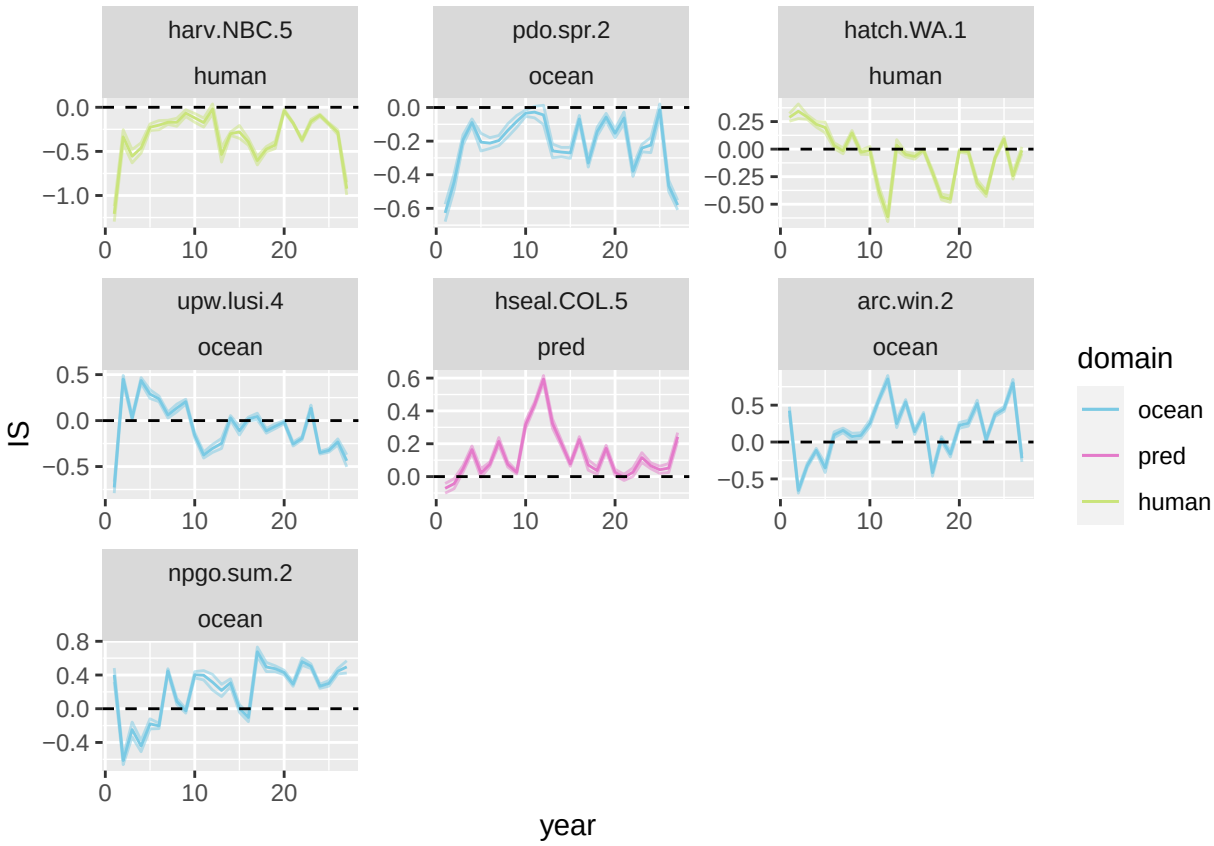

```
# distribution

ggplot(rec5_MFS, aes(x = value, color = domain, fill = domain)) +
  geom_density(alpha = 0.4) +
  scale_color_manual(values = pal) +
  scale_fill_manual(values = pal) +
    geom_vline(aes(xintercept = mu, color = domain),
               linetype = "dashed") +
  facet_grid(FP ~ .)
```



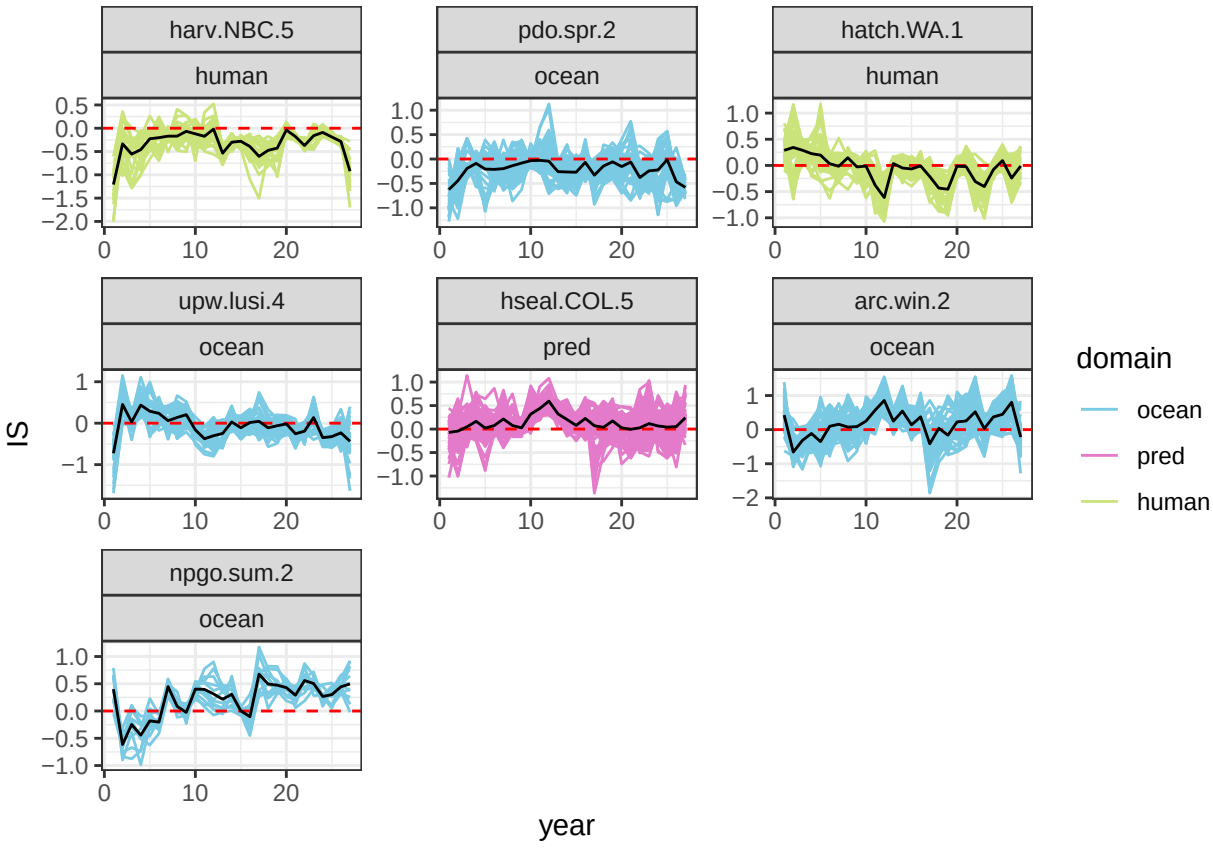
#

3. How do predator interaction strengths (and vars from other domains) vary through time? ### Times series of partial Derivatives, averaged across stocks, for each var

```
rec5_MFS_ts <- rec5_MFS %>%
  filter(year > 1957) %>%
  filter(year < 2016) %>%
  mutate(year = factor(year)) %>%
  group_by(year, FP) %>%
  mutate(IS = mean(value, na.rm = TRUE),
            sd = sd(value, na.rm = TRUE),
            n = n()) %>%
  mutate(se = sd / sqrt(n),
         lower = IS - qt(1 - (0.05 / 2), n - 1) * se,
         upper = IS + qt(1 - (0.05 / 2), n - 1) * se) %>%
  mutate(year = as.integer(year))

ggplot(rec5_MFS_ts, aes(x = year, color = domain, fill = domain)) +
  geom_line(aes(y = IS)) +
  geom_line(aes(y = upper), alpha = 0.5) +
  geom_line(aes(y = lower), alpha = 0.5) +
  geom_hline(aes(yintercept = 0),
             linetype = "dashed") +
    scale_fill_manual(values = pal) +
  scale_color_manual(values = pal) +
     facet_wrap(~ FP + domain, scales = "free")
```




```
rec5_MFS_lines <- rec5_MFS %>%
  filter(year > 1957) %>%
  filter(year < 2016) %>%
  mutate(year = factor(year)) %>%
  group_by(year, FP, embedding) %>%
  mutate(IS = mean(value)) %>%
  mutate(year = as.integer(year))


ggplot() +
  geom_line(rec5_MFS_lines, mapping = aes(x=year, y=IS, col=domain, group=embedding)) +
  scale_fill_manual(values = pal) +
  scale_color_manual(values = pal) +
  geom_hline(rec5_MFS_lines, mapping = aes(yintercept = 0),linetype = "dashed", color = "red") +
  geom_line(rec5_MFS_ts, mapping = aes(x=year, y=IS), color = "black") +
  facet_wrap(FP + domain ~ ., scales = "free") +
  theme_bw()
```



UPS

2a. What variables are in the top models? In what frequency?

To do that right, we need to actually through ALL the vars in the SMAP hopper, not just the top ones

But I can get an highest and average rank model that each var shows up in

```
unique(rec5_UPS$FP)
```

```
## [1] "rec5n"      "rec5n_-3"   "arc.win.4"  "pdo.sum.2"  "upw.tdmi.4"
## [6] "rec5n_-2"   "npgo.spr.2" "rec5n_-1"   "rec5n_-4"
```

```
unique(rec5_UPS$embedding) # 36
```

```
##  [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
## [26] 26 27 28 29 30 31 32 33 34 35 36
```

```
em_rec5_UPS <- as.numeric(length(unique(rec5_UPS$embedding)))

rec5_mods_UPS <- rec5_UPS %>%
  group_by(embedding, FP) %>%
  summarise() %>%
  group_by(FP) %>%
  mutate(
    best_mod = min(embedding), # lowest number (highest rank) model
```

FP	best_mod	prop_mod	rank_mod
arc.win.4	1	0.8055556	0.4885057
npgo.spr.2	3	0.4444444	0.4791667
pdo.sum.2	1	0.6111111	0.4179293
upw.tdmi.4	1	0.4722222	0.4950980

```
    scale_mod = 1 / best_mod, # above expressed as 0-1
    rank_mod = mean(embedding)/em_rec5_UPS , # average rank of model that that they are in
    total_num = length(embedding), # number of models that they are in
    prop_mod = total_num/em_rec5_UPS , # proportion of model that they are in
    weight = em_rec5_UPS -embedding, # reverse of rank
    integrated = sum(weight)/(em_rec5_UPS *(em_rec5_UPS+1) /2)) %>% # integrate rank and weight
  slice(1) %>%
  filter(!grepl("rec5", FP)) %>%
  ungroup()
```

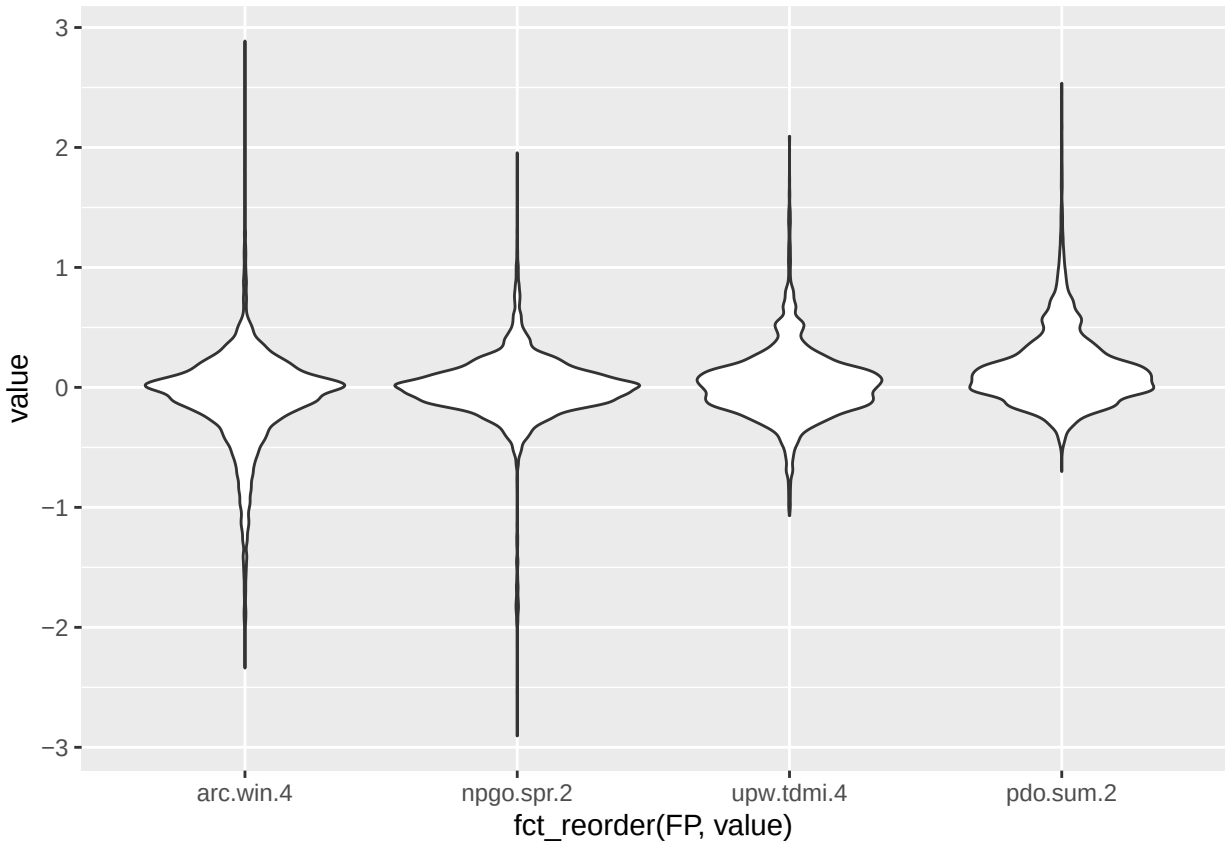
```
## `summarise()` has grouped output by 'embedding'. You can override using the `.groups` argument.
```

```
# Make a table instead

rec5_table_UPS <- rec5_mods_UPS %>%
  select(FP, best_mod, prop_mod, rank_mod)

rec5_table_UPS %>%
  kbl() %>%
  kable_classic_2(full_width = F)
```

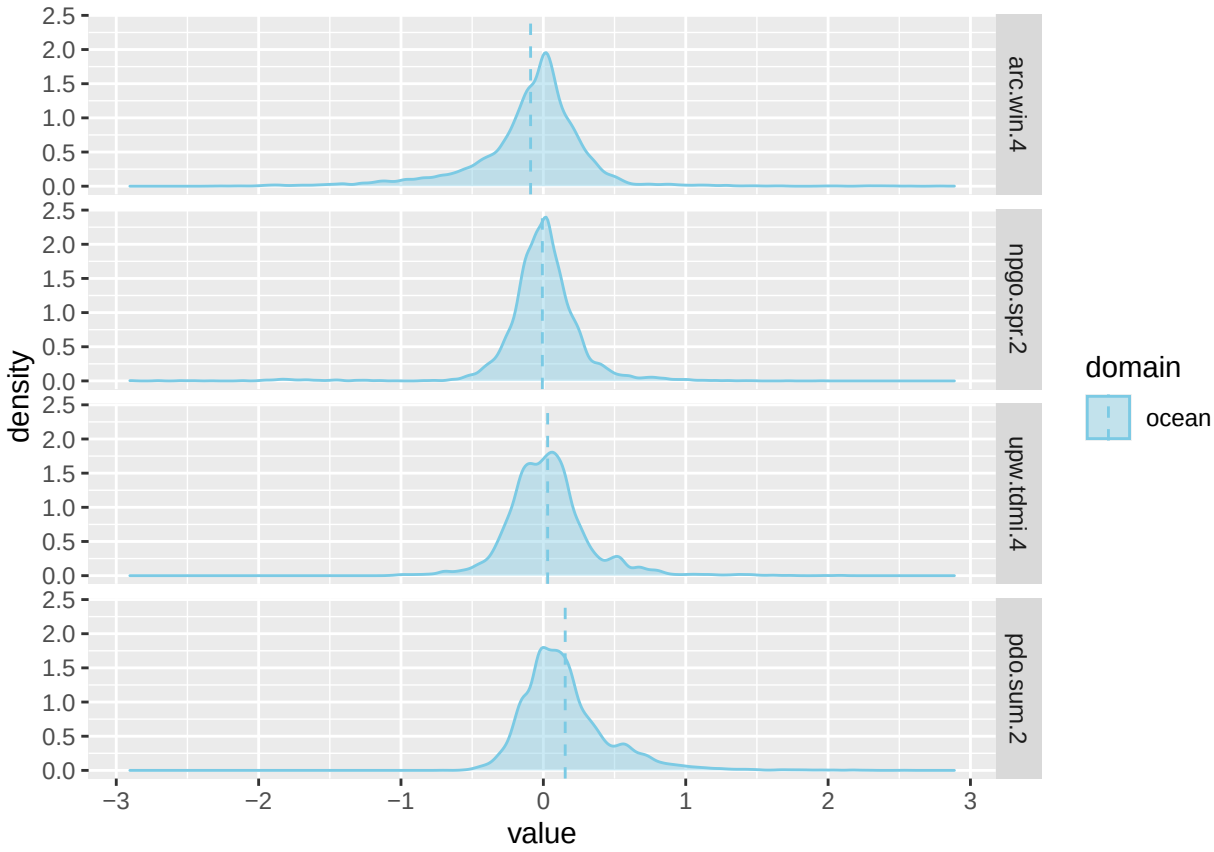
2b. How do predator interaction strengths compared to variables from other domains (ocean, human)?

Partial Derivatives, averaged across stocks, and across years, for each

```
rec5_UPS<-  rec5_UPS  %>%
  filter(!grepl("rec5", FP)) %>%
  filter(!grepl("flow", FP)) %>%
  group_by(FP) %>%
  mutate(mu = mean(value, na.rm=TRUE)) %>%
  ungroup()

ggplot(rec5_UPS, aes(x = fct_reorder(FP, value), y = value)) +
  geom_violin()
```




```
rec5_UPS$FP <- fct_reorder(rec5_UPS$FP, rec5_UPS$mu, min)

ggplot(rec5_UPS, aes(x = value, color = domain, fill = domain)) +
  geom_density(alpha = 0.4) +
  scale_color_manual(values = pal) +
  scale_fill_manual(values = pal) +
    geom_vline(aes(xintercept = mu, color = domain),
               linetype = "dashed") +
  facet_grid(FP ~ .)
```

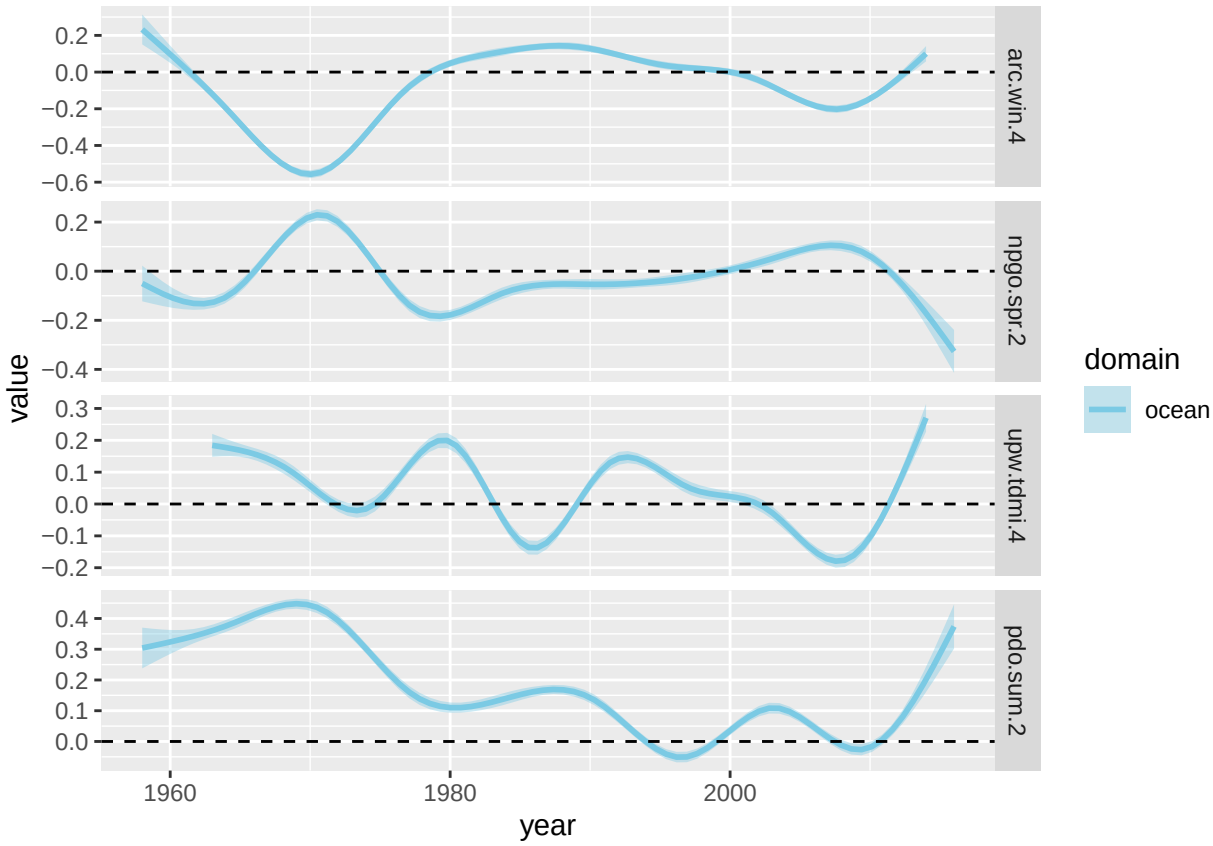


3. How do predator interaction strengths (and vars from other domains) vary through time?

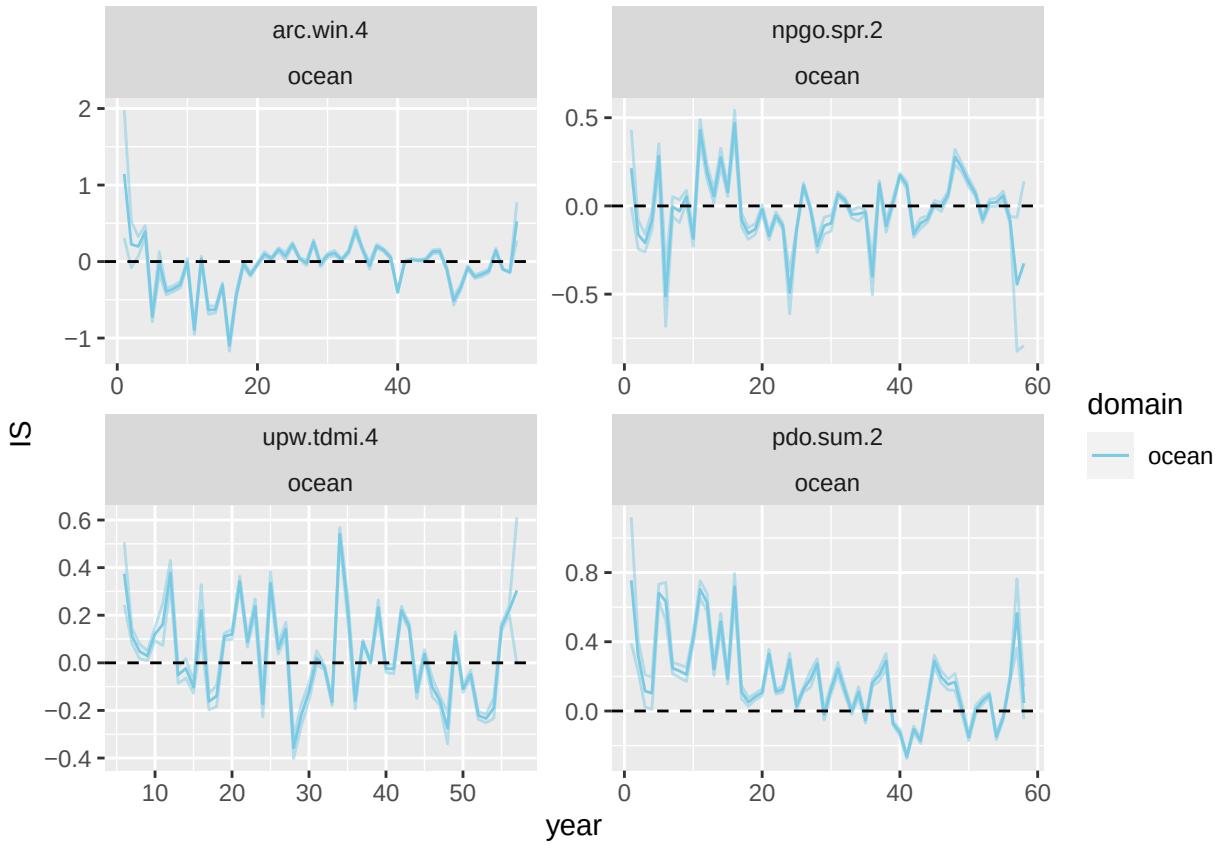
Times series of partial Derivatives, averaged across stocks, for each var

```
ggplot(rec5_UPS, aes(x = year, y = value, fill = domain, color = domain)) +
  geom_smooth() +
  scale_fill_manual(values = pal) +
  scale_color_manual(values = pal) +
    geom_hline(aes(yintercept = 0),
               linetype = "dashed") +
  facet_grid(FP ~ ., scales = "free")
```

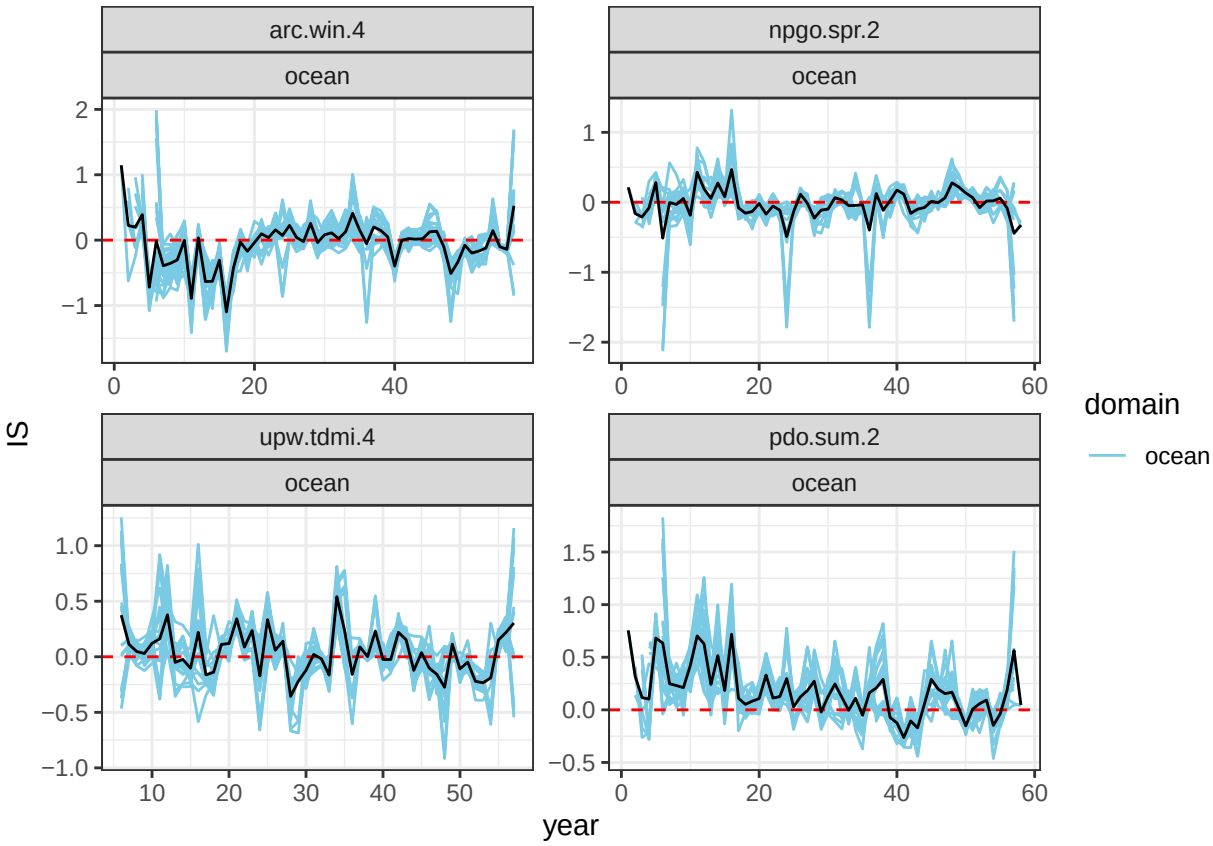
```
## `geom_smooth()` using method = 'gam' and formula 'y ~ s(x, bs = "cs")'
```




```
rec5_UPS_ts <- rec5_UPS %>%
  filter(year > 1957) %>%
  filter(year < 2016) %>%
  mutate(year = factor(year)) %>%
  group_by(year, FP) %>%
  mutate(IS = mean(value, na.rm = TRUE),
            sd = sd(value, na.rm = TRUE),
            n = n()) %>%
  mutate(se = sd / sqrt(n),
         lower = IS - qt(1 - (0.05 / 2), n - 1) * se,
         upper = IS + qt(1 - (0.05 / 2), n - 1) * se) %>%
  mutate(year = as.integer(year))

ggplot(rec5_UPS_ts, aes(x = year, color = domain, fill = domain)) +
  geom_line(aes(y = IS)) +
  geom_line(aes(y = upper), alpha = 0.5) +
  geom_line(aes(y = lower), alpha = 0.5) +
  geom_hline(aes(yintercept = 0),
             linetype = "dashed") +
    scale_fill_manual(values = pal) +
  scale_color_manual(values = pal) +
     facet_wrap(~ FP + domain, scales = "free")
```




```
rec5_UPS_lines <- rec5_UPS %>%
  filter(year > 1957) %>%
  filter(year < 2016) %>%
  mutate(year = factor(year)) %>%
  group_by(year, FP, embedding) %>%
  mutate(IS = mean(value)) %>%
  mutate(year = as.integer(year))


ggplot() +
  geom_line(rec5_UPS_lines, mapping = aes(x=year, y=IS, col=domain, group=embedding)) +
  scale_fill_manual(values = pal) +
  scale_color_manual(values = pal) +
  geom_hline(rec5_UPS_lines, mapping = aes(yintercept = 0),linetype = "dashed", color = "red") +
  geom_line(rec5_UPS_ts, mapping = aes(x=year, y=IS), color = "black") +
  facet_wrap(FP + domain ~ ., scales = "free") +
  theme_bw()
```


arc.win.4
ocean
npgo.spr.2
ocean
upw.tdmi.4
ocean
pdo.sum.2
ocean
SI
year
domain
ocean

Fin