Publication code

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## Auto calibration R code

# Auto-calibration of DYRESM-CAEDYM using the dycdTools package  
library(dycdTools)  
autoCalibration(cal.para = "Calibration parameters.csv",  
 combination = "all",  
 model.var = c("TEMP"),  
 obs.data = "Obs data\_tempolate.csv",  
 objective.function = c("nse"),  
 start.date="2002-01-23",  
 end.date="2016-12-31",  
 dycd.wd = "DYCD\_Okaraka",  
 dycd.output = "DYCD\_Okareka/DYsim.nc",  
 file\_name = "Auto-calibration.csv")

## Heat map of NSE values for different combinations of parameters’ values

# Read in model auto-calibration results  
calibration<-read.csv("Auto-calibration.csv")  
colnames(calibration)[4]<-"nse.temp"  
  
# Heatmap  
library(ggplot2)  
library(dplyr)  
  
calibration%>%  
 ggplot(aes(x=wse,y=vmc,fill=nse.temp))+  
 geom\_tile()+  
 scale\_fill\_distiller(palette = "PuBu",direction = 1)+  
 facet\_grid(~lec)+  
 xlab("Wind stirring efficiency")+  
 ylab("Vertical mixing coefficient")+  
 labs(title="Light extinction coefficient",fill="NSE")+  
 theme\_bw()+  
 theme(plot.title = element\_text(size=11,hjust = 0.5))+  
 ggsave(filename = "Heatmap of NSE values for the temperature simulation.png")

## Contour plot

# Extract temperature simulations  
var.values<-extract.output(dycd.output = "DYCD\_Okareka/DYsim.nc",  
 var.extract = c("TEMP"))  
  
for(i in 1:length(var.values)){  
 expres<-paste0(names(var.values)[i],"<-data.frame(var.values[[",i,"]])")  
 eval(parse(text=expres))  
}  
  
# Interpolation of temperature across water column at an interval of 0.5 m  
temp.interpolated<-interpol(layerHeights = dyresmLAYER\_HTS\_Var,  
 var = dyresmTEMPTURE\_Var,  
 min.dept = 0,max.dept = 33,by.value = 0.5)  
  
# Read in observed water quality data  
obs.okareka<-read.csv("Obs data\_tempolate.csv")  
obs.okareka$Date<-as.Date(obs.okareka$Date,format="%d/%m/%Y")  
obs.temp<-obs.okareka[,c(1,2,3)]  
  
# Contour plot  
contour.plot(sim = temp.interpolated,  
 obs = obs.temp,  
 file\_name = "contour\_temp.png",  
 start.date="2002-01-01",  
 end.date="2016-12-31",  
 legend.title = "T\n(\u00B0C)",  
 min.depth = 0,  
 max.depth = 33,  
 by.value = 0.5)

## Profile plot

# Profile plot  
profile.plot(sim=temp.interpolated,  
 obs = obs.temp,  
 sim.start = "2002-01-23",  
 sim.end = "2016-12-31",  
 plot.start = "2002-01-23",  
 plot.end = "2002-12-31",  
 file\_name = "profile plot\_temp.png",  
 min.depth = 0,  
 max.depth = 33,  
 by.value = 0.5,  
 xlabel = "Temperature \u00B0C",  
 height = 4,  
 width = 7)

## Time series plot

# Time serise plot  
ts.plot(sim = temp.interpolated,  
 obs = obs.temp,  
 file\_name=paste0("TS\_temp.png"),  
 target.depth=c(1,14,30),  
 sim.start="2002-01-23",  
 sim.end="2016-12-31",  
 plot.start = "2002-01-23",  
 plot.end="2012-12-31",  
 min.depth=0,  
 max.depth=33,  
 by.value=0.5,  
 ylabel="Temperature \u00B0C",  
 height = 4,  
 width = 7)

## Scater plot

# Scatter plot  
scatter.plot(sim=temp.interpolated,  
 obs=obs.temp,  
 sim.start="2002-01-23",  
 sim.end="2016-12-31",  
 plot.start = "2002-01-23",  
 plot.end="2012-12-31",  
 file\_name = "scatter plot\_temp.png",  
 min.depth = 0,  
 max.depth = 33,  
 by.value = 0.5,  
 height = 4,  
 width = 7)