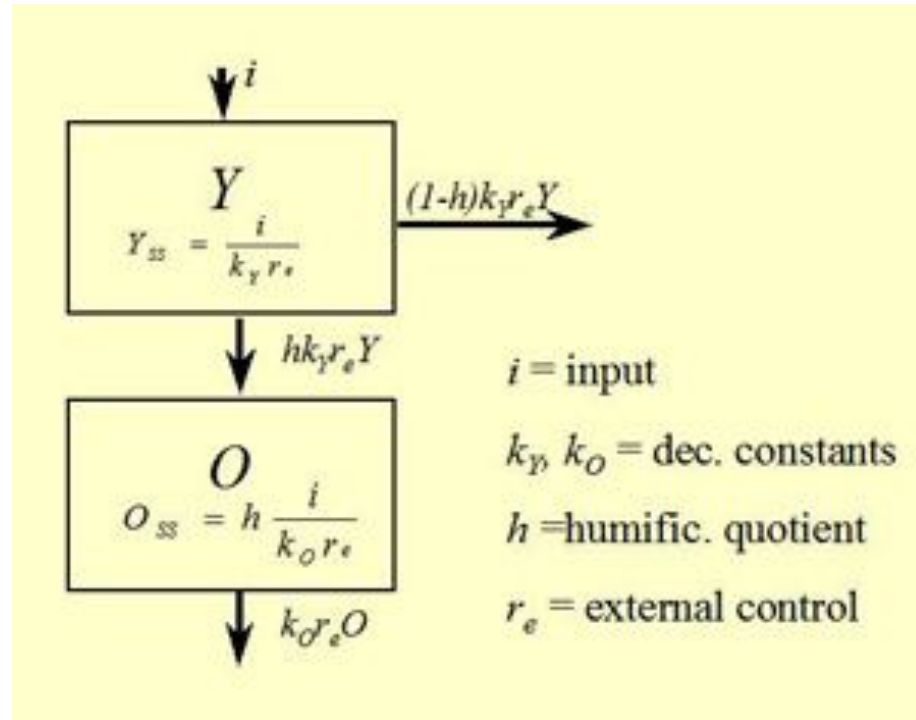


# Migrating ICBM Re calculator from C# to R

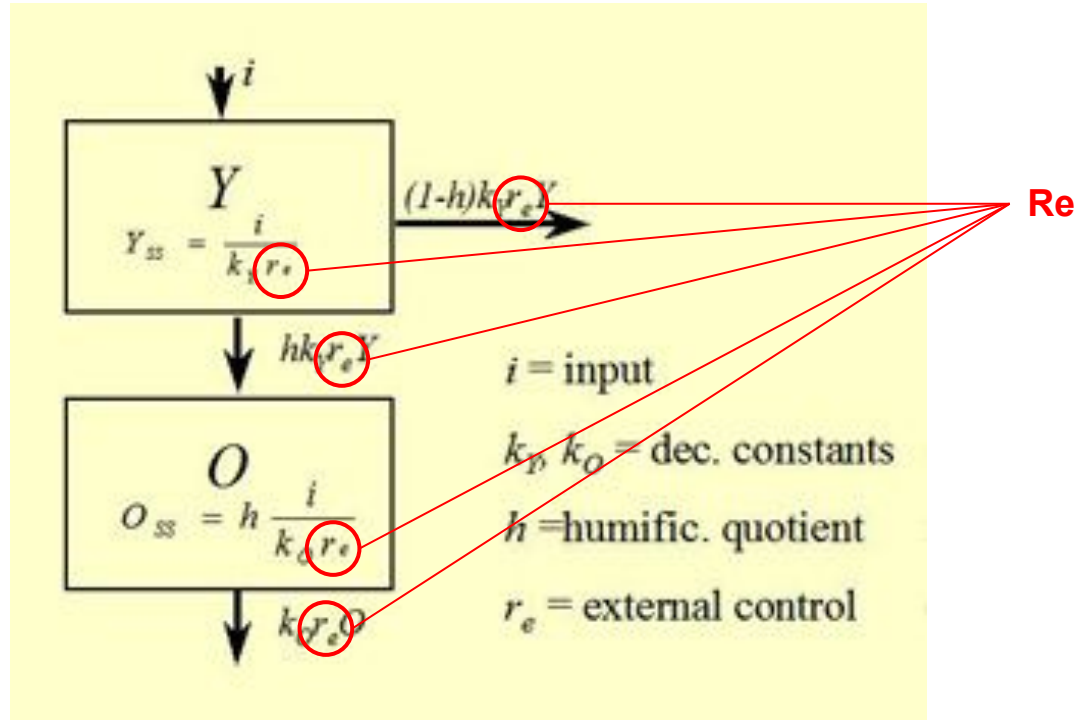
Francis Durnin-Vermette,  
Arumugam Thiagarajan



# ICBM



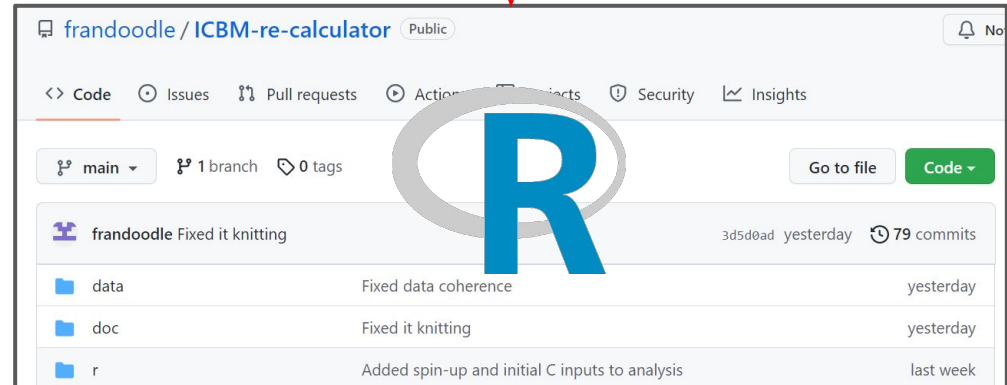
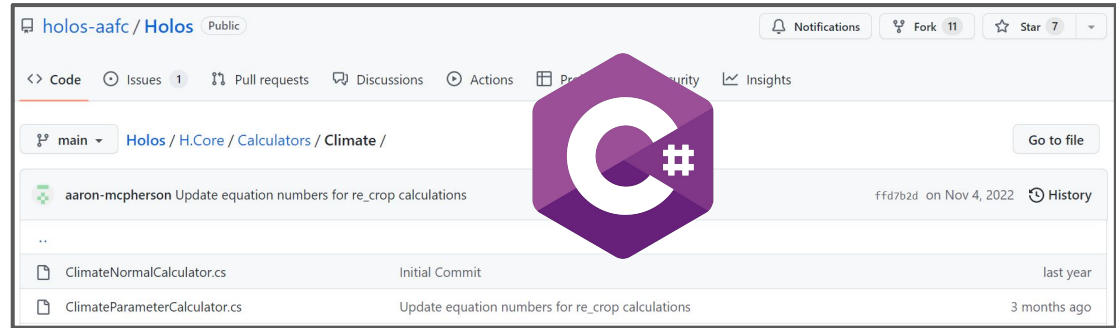
## ICBM



## 1. Migrating ICBM Re calculator from C# to R

# ICBM Re Calculator

- Migrated the Holos ICBM Re calculator (C#) into R code
- The current public repository for this code is ICBM-re-calculator (<https://github.com/frandoodle/ICBM-re-calculator>)



# ICBM Re Calculator

- Standalone Re calculation also implemented

```
calculate_re <- function(YearInputTable,  
  yield,  
  perennial,  
  SoilOrganicC_Percent,  
  ClayContent,  
  SandContent,  
  alfa = 0.7,  
  SoilTopThickness = 250,  
  Temp_min = -3.78,  
  Temp_max = 30,  
  r_s = 0.42,  
  r_wp = 0.18,  
  ReferenceAdjustment = 0.10516,  
  r_c = NA,  
  tillage_soil = "Brown",  
  tillage_type = "Intensive Tillage",  
  irrigation_region = "Canada",  
  irrigation_use_estimate = FALSE,  
  irrigation = 0,  
  ...)
```

# ICBM Re Calculator

- Standalone Re calculation also implemented
- Full code walkthrough, documentation, and QC testing found in [doc/walkthrough\\_re.html](doc/walkthrough_re.html)

## Running ICBM $r_e$ Calculator

Francis Durnin-Vermette

2022/11/22

- 1 Quick Start -  $r_e$  Calculator
- 2 Walkthrough
  - 2.1 Input data
  - 2.2 Green area index (GAI) dynamics
    - 2.2.1 Eq. 2.2.1-1 through Eq. 2.2.1-3
  - 2.3 Water content at wilting point and field capacity
    - 2.3.1 Eq. 2.2.1-4 through Eq. 2.2.1-10
  - 2.4 Soil temperature
    - 2.4.1 Eq. 2.2.1-11 & Eq. 2.2.1-12
  - 2.5 Surface temperature
    - 2.5.1 Eq. 2.2.1-13 & Eq. 2.2.1-14
  - 2.6 Soil Temperature
    - 2.6.1 Sidenote: handling recursive equations
    - 2.6.2 Eq. 2.2.1-15 & Eq. 2.2.1-16
  - 2.7 Irrigation
    - 2.7.1 Monthly distribution of irrigation
    - 2.7.2 Eq. 2.2.1-17 & Eq. 2.2.1-18
  - 2.8 Crop Evapotranspiration
    - 2.8.1 Eq. 2.2.1-19 & Eq. 2.2.1-20
  - 2.9 Soil Available Water
    - 2.9.1 Eq. 2.2.1-21 through Eq. 2.2.1-24
  - 2.10 Water Balance
    - 2.10.1 Eq. 2.2.1-25 through Eq. 2.2.1-35
  - 2.11 Decomposition rate - effect of soil temperature
    - 2.11.1 Eq. 2.2.1-36 & Eq. 2.2.1-37
  - 2.12 Decomposition rate - effect of soil moisture
    - 2.12.1 Eq. 2.2.1-38 through Eq. 2.2.1-43
  - 2.13 Climate Factor ( $r_{e_{crop}}$ )
    - 2.13.1 Eq. 2.2.1-44 through Eq. 2.2.1-46
  - 2.14 Tillage Factor ( $r_c$ )
  - 2.15 Climate/management Factor ( $r_e$ )
    - 2.15.1 Eq. 2.2.1-47

# ICBM Re Calculator - QC Testing

Using Ellerslie 1983 site + climate data...

Yield = 2181

Clay = 0.39

Sand = 0.17

- Holos implementation:  $r_e = 1.036275$
- R implementation:  $r_e = 1.036275$

