

Operational CREST workflow and model runtime setting

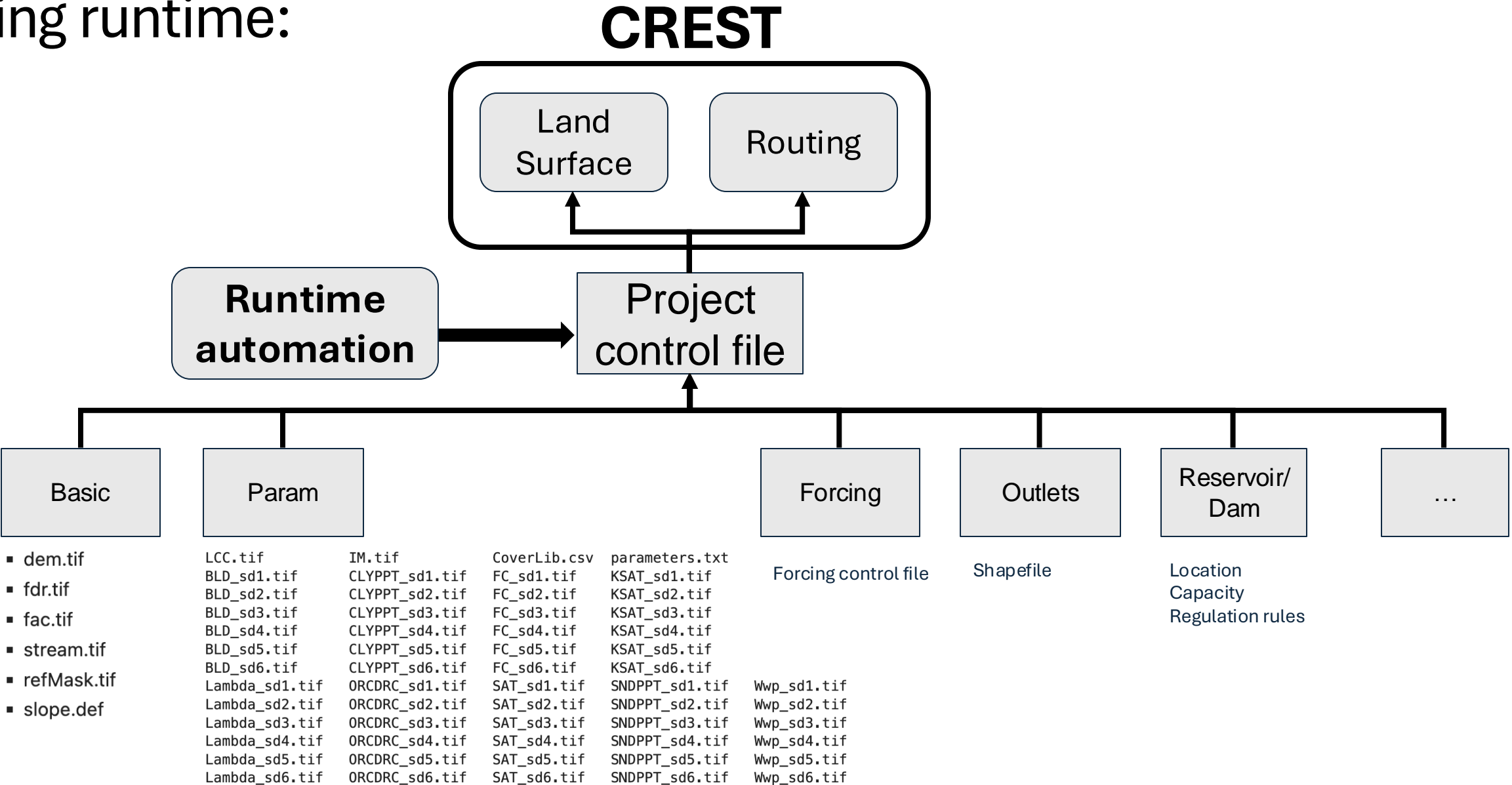
(Henry) Qing Yang, Ph.D.

Course timeline

14:30 - 16:30 GMT+3

2 Sessions, 1 break.

During runtime:



What to specify in control files:

- 1.Temporal domain.
- 2.Input file, folder, and sub-control file.
- 3.Output locations.
- 4.Options.

Tree structure of project folders and control files:

```
MidWestCoast
├── ICS
├── basic
├── calibration
├── forcing
├── obs
└── param
```

```
└── MidWestCoast
    ├── ICS
    │   └── InitialConditions.txt
    ├── calibration
    │   └── calibrations.txt
    ├── forcing
    │   └── forcing_WRFevent.txt
    ├── param
    │   └── J-415DoneCaliParametersS06.txt
    └── run.project
```

In param folder:

LCC.tif	IM.tif	CoverLib.csv	parameters.txt	What are these two?
BLD_sd1.tif	CLYPPT_sd1.tif	FC_sd1.tif	KSAT_sd1.tif	
BLD_sd2.tif	CLYPPT_sd2.tif	FC_sd2.tif	KSAT_sd2.tif	
BLD_sd3.tif	CLYPPT_sd3.tif	FC_sd3.tif	KSAT_sd3.tif	
BLD_sd4.tif	CLYPPT_sd4.tif	FC_sd4.tif	KSAT_sd4.tif	
BLD_sd5.tif	CLYPPT_sd5.tif	FC_sd5.tif	KSAT_sd5.tif	
BLD_sd6.tif	CLYPPT_sd6.tif	FC_sd6.tif	KSAT_sd6.tif	
Lambda_sd1.tif	ORCDRC_sd1.tif	SAT_sd1.tif	SNDPPT_sd1.tif	Wwp_sd1.tif
Lambda_sd2.tif	ORCDRC_sd2.tif	SAT_sd2.tif	SNDPPT_sd2.tif	Wwp_sd2.tif
Lambda_sd3.tif	ORCDRC_sd3.tif	SAT_sd3.tif	SNDPPT_sd3.tif	Wwp_sd3.tif
Lambda_sd4.tif	ORCDRC_sd4.tif	SAT_sd4.tif	SNDPPT_sd4.tif	Wwp_sd4.tif
Lambda_sd5.tif	ORCDRC_sd5.tif	SAT_sd5.tif	SNDPPT_sd5.tif	Wwp_sd5.tif
Lambda_sd6.tif	ORCDRC_sd6.tif	SAT_sd6.tif	SNDPPT_sd6.tif	Wwp_sd6.tif

CoverLib.csv: Vegetation (cover) parameters table (library).

parameters.txt: control file for param folder.

Vegetation parameters table

Shen, Xinyi, and Emmanouil N. Anagnostou. 2017. "A Framework to Improve Hyper-Resolution Hydrological Simulation in Snow-Affected Regions." *Journal of Hydrology* 552 (September): 1–12.

Vegetation parameters. All parameters are cover-type dependent and parameters before h_{wind} changes every month.

Parameter	Description	Unit
α	Shortwave albedo	N/A
r	Roughness length	m
h	Displacement height	N/A
h_{wind}	Wind measured height	m
tr_0	Minimum incoming shortwave radiation to trigger transpiration	W/m ²
τ_R	Radiation attenuation factor	N/A
τ_{wind}	Wind speed attenuation factor	N/A
b_c	Whether the type Has a canopy layer	true false
r_{trunk}	Trunk ratio	N/A
$d_i, i = 1,2,3$	Root zone thickness	m
$f_i, i = 1,2,3$	Root zone fraction	N/A
r_0	minimum stomatal resistance to evaporation	s/m
r_c	Architectural resistance to evaporation	s/m

For ET rate, vegetation interception, and thermal aerodynamics.

Could directly use:

https://github.com/QingYang6/CREST_tutorial/blob/main/training_project/MidWestCoast/param/CoverLib.csv

Control file for param

- 1.Specify files for land cover, soil hydraulic properties, and tables.
- 2.Settings, options, and parameters.

```
#####  
# Saturated(maximal) soil moisture (%)  
#####  
SatType          =      Distributed #  
nLayers_Sat      =      6  
SAT_sd1.tif      Sat_depth_1      =      0.05 #(m)  
SAT_sd2.tif      Sat_1            =      SAT_sd1.tif  
SAT_sd3.tif      Sat_depth_2      =      0.1 #(m)  
SAT_sd4.tif      Sat_2            =      SAT_sd2.tif  
SAT_sd5.tif      Sat_depth_3      =      0.15 #(m)  
SAT_sd6.tif      Sat_3            =      SAT_sd3.tif  
Sat_depth_4      =      0.30 #(m)  
Sat_4            =      SAT_sd4.tif  
Sat_depth_5      =      0.40 #(m)  
Sat_5            =      SAT_sd5.tif  
Sat_depth_6      =      1.00 #(m)  
Sat_6            =      SAT_sd6.tif
```

Saturated_layer1.tif
Saturated_layer2.tif
Saturated_layer3.tif
Saturated_layer4.tif
Saturated_layer5.tif
Saturated_layer6.tif

```
#####  
# Saturated(maximal) soil moisture (%)  
#####  
SatType          =      Distributed #  
nLayers_Sat      =      6  
Saturated_layer1.tif Sat_depth_1      =      0.05 #(m)  
Saturated_layer2.tif Sat_1            =      Saturated_layer1.tif  
Saturated_layer3.tif Sat_depth_2      =      0.1 #(m)  
Saturated_layer4.tif Sat_2            =      Saturated_layer2.tif  
Saturated_layer5.tif Sat_depth_3      =      0.15 #(m)  
Saturated_layer6.tif Sat_3            =      Saturated_layer3.tif  
Sat_depth_4      =      0.30 #(m)  
Sat_4            =      Saturated_layer4.tif  
Sat_depth_5      =      0.40 #(m)  
Sat_5            =      Saturated_layer5.tif  
Sat_depth_6      =      1.00 #(m)  
Sat_6            =      Saturated_layer6.tif
```

https://github.com/QingYang6/CREST_tutorial/blob/main/control_file_template/parameters_file.md

InitialConditions.txt

https://github.com/QingYang6/CREST_tutorial/blob/main/control_file_template/InitialConditions_file.md

calibrations.txt

https://github.com/QingYang6/CREST_tutorial/blob/main/control_file_template/calibrations_file.md

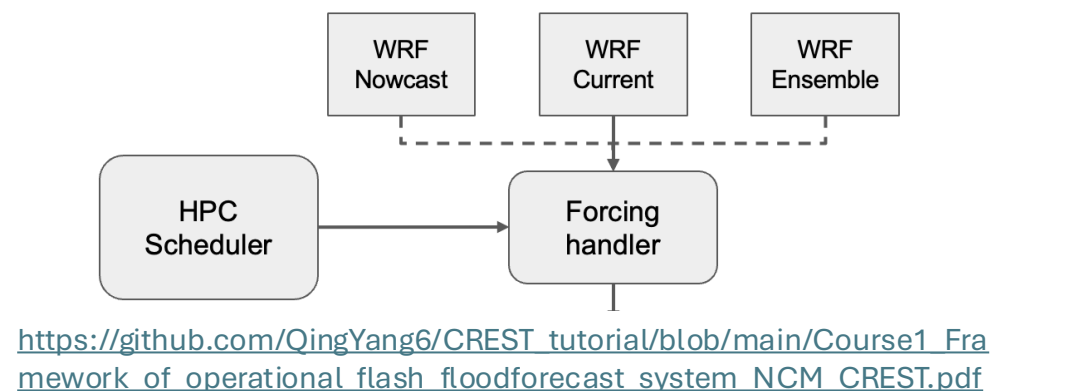
Two control files for operational configuration

```
└─ MidwestCoast
   └─ ICS
      └─ InitialConditions.txt
   └─ calibration
      └─ calibrations.txt
   └─ forcing
      └─ forcing_WRFevent.txt
   └─ param
      └─ J-415DoneCaliParametersS06.txt
   └─ run.project
```

1. Forcing control file.
2. Project control file.

Automation of project files

Triggered by scheduler, specified by handler.



Temporal domain in .project file.

```
TimeFormatLS      =      yyyyymmddHHMM
TimeStepLS        =      1
StartDateLS        =      202411050030
WarmupDateLS      =      202411050130
EndDateLS         =      202411092330
# Time line of Routing Process#####
LoadDates         =      #
TimeMarkRoute     =      h
TimeFormatRoute   =      yyyyymmddHHMM
TimeStepRoute     =      1
StartDateRoute    =      202411050030
WarmupDateRoute   =      202411050130
EndDateRoute      =      202411092330
```

