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*Supplement of*

# Development of a novel storm surge inundation model framework for efficient prediction

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# Instruction manual

Find data from http:// 10.5281/zenodo.10596631 (Gao et al.,2024)
Find code from http:// 10.5281/zenodo.10596826 (Gao, 2024).

## S1. Folder structure

```
├──Code
│   ├─.idea
│   ├─ANALYSIS
│   ├─HCA-FM
│   ├─PREDATA
│   └─workspace.gdb
├──Data
│   ├─ADCIRC_SWAN
│   │   ├─Hato
│   │   ├─Lekima
│   │   └─Polly
│   ├─FIGURE
│   │   ├─figure1
│   │   ├─figure2
│   │   ├─figure3
│   │   ├─figure4
│   │   ├─figure5
│   │   └─figure6
│   └─HCA_FM
│       ├─CZ
│       │   └─Lekima
│       │       ├─INPUT
│       │       ├─observation
│       │       ├─OUTPUT
│       │       │   └─ta1_tb1_n0
│       │       └─PreData
│       ├─LZW
│       │   ├─Lekima
│       │   │   ├─compare
│       │   │   ├─INPUT
│       │   │   ├─OUTPUT
│       │   │   │   ├─ta0_tb0_n1
│       │   │   │   ├─ta0_tb1_n1
│       │   │   │   ├─ta1_tb0_n1
│       │   │   │   └─ta1_tb1_n1
│       │   │   └─PreData
│       │   └─Polly
```

```
|       |       ├─compare
|       |       ├─INPUT
|       |       ├─OUTPUT
|       |       |   ├─ta0_tb0_n1
|       |       |   ├─ta0_tb1_n1
|       |       |   ├─ta1_tb0_n1
|       |       |   └─ta1_tb1_n1
|       |       └─PreData
|       └─SZ
|           └─Hato
|               ├─INPUT
|               ├─observation
|               ├─OUTPUT
|               |   └─ta1_tb1_n0
|               └─PreData
```

***Notes.***

- ***Software requirements:***

  *Matlab (R2022a), Python 2.7, ArcGIS (Version 10.8), TeXstudio (Version 2.12.8)*

- ***Tips:***

  *Please run programs in their path*

  *please change workspace path (workspace.gdb) in python programs and mainpath (Data folder) in FloDefs.py before run python programs*

- ***Parameters for different experiments (change in the codes)***

  *Regions: CZ (Cangzhou, Hebei), LZW (Laizhou Bay), SZ (Shenzhen, Guangdong)*

  *Typhoons: Lekima (1909), Polly (9216), Hato (1713)*

- ***Description:***

… / Code / PREDATA: code for creating the input files of HCA-FM

FortToMat.m

CreatBC.m (subfunction: m_UVdir.m)

CreatIC.py (subfunction: FloDefs.py)

… / Code / HCA_FM: main program and subfunctions of HCA-FM

HCA_FM.mlx (subfunctions: m_count.m, m_neighbor.m)

… / Code / ANALYSIS: main program and sunfunctions to convert files and compare results between two models

Analysis.py (subfunction: FloDefs.py)

… / Data / ADCIRC_SWAN / *Typhoon*

input (fort.14/15/22/26) and output (fort.63/64) files of ADCIRC+SWAN coupled model

… / Data / HCA_FM / *Region* / *Typhoon* / PreData

datasets used to creat input files for HCA-FM including DEM, landcover, wind, boundary water level and velocity

… / Data / HCA_FM / *Region* / *Typhoon* / INPUT

input files for HCA-FM: BIC.mat

… / Data / HCA_FM / *Region* / *Typhoon* / OUTPUT

output files of HCA-FM, and comparative results to ADCIRC-SWAN:

OUTDATA.mat

depth.tif, range.shp

analysis.txt, COMPARE.mat

… / Data / HCA_FM / *Region* / *Typhoon* / compare

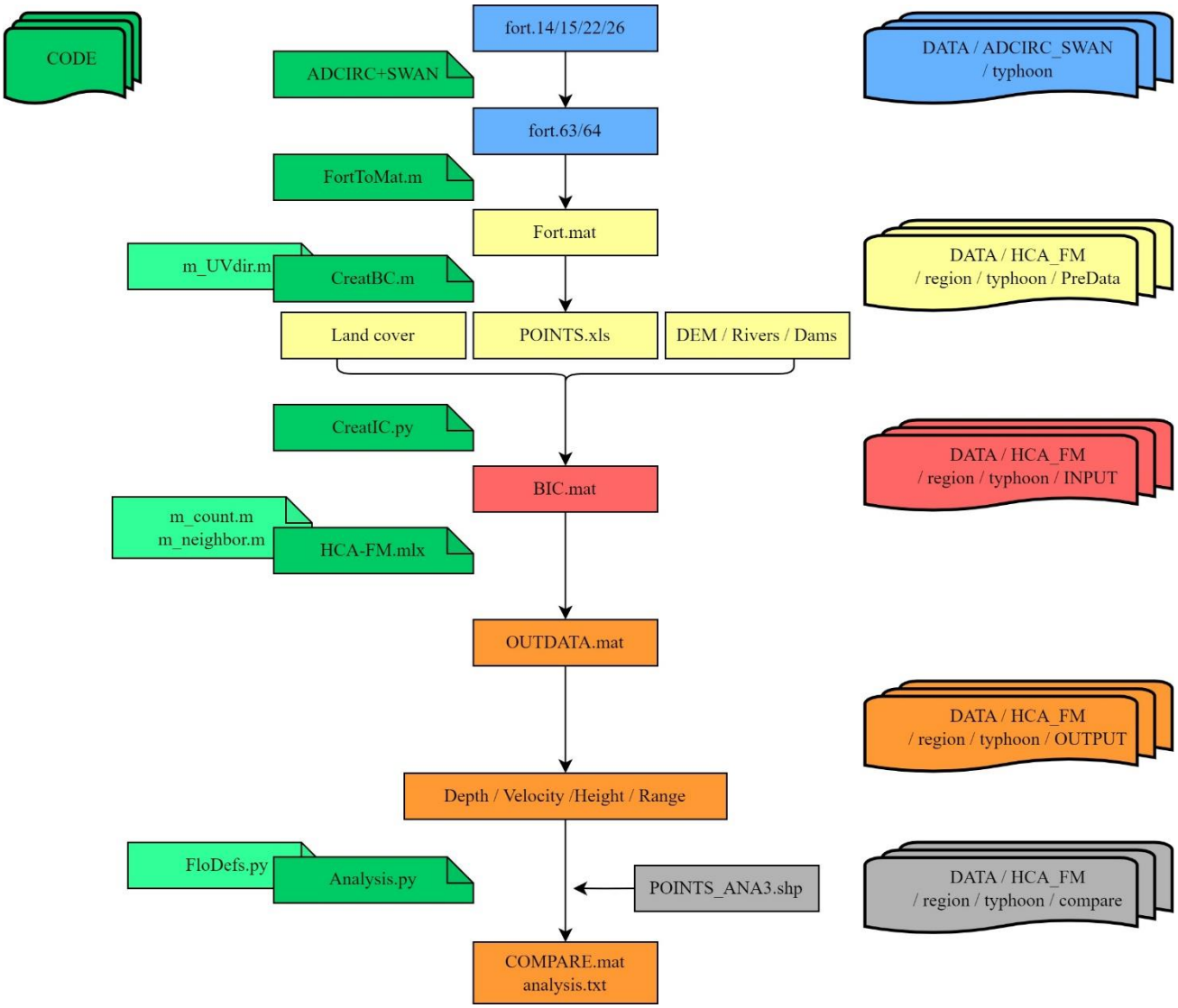
Points at which comparation is made between HCA-FM and ADCIRC+SWAN results

… / Data / HCA_FM / *Region* / *Typhoon* / observation

field survey data

… / Data / FIGURE: programs to produce figures in paper

## S2. Experimental procedures




1. Run ADCIRC+SWAN coupled model
   - Input fort.14/15/22/26
   - Output fort.63/64

   Detailed information about ADCIRC+SWAN please refer to https://ccht.ccee.ncsu.edu/swanadcirc/; https://adcirc.org/home/documentation/adcirc-related-publications/
2. Prepare input files for HCA-FM
   - Run FortToMat.m Output Fort.mat

- Run CreatBC.m Output POINTS.xls
- Run CreatIC.py Output BIC.mat

3. Run HCA-FM
   - Run HCA_FM.mlx Output OUTPUT.mat
4. Analysis results
   - Run Analysis.py Output depth.tif, range.shp
     Output COMPARE.mat, analysis.txt (compared with ADCIRC+SWAN)
5. Draw figures
   - Figure 1
   - Figure 2
   - Figure 3
   - Figure 4
   - Figure 5
   - Figure 6