CREST
Coupled Routing and Excess STorage Introduction

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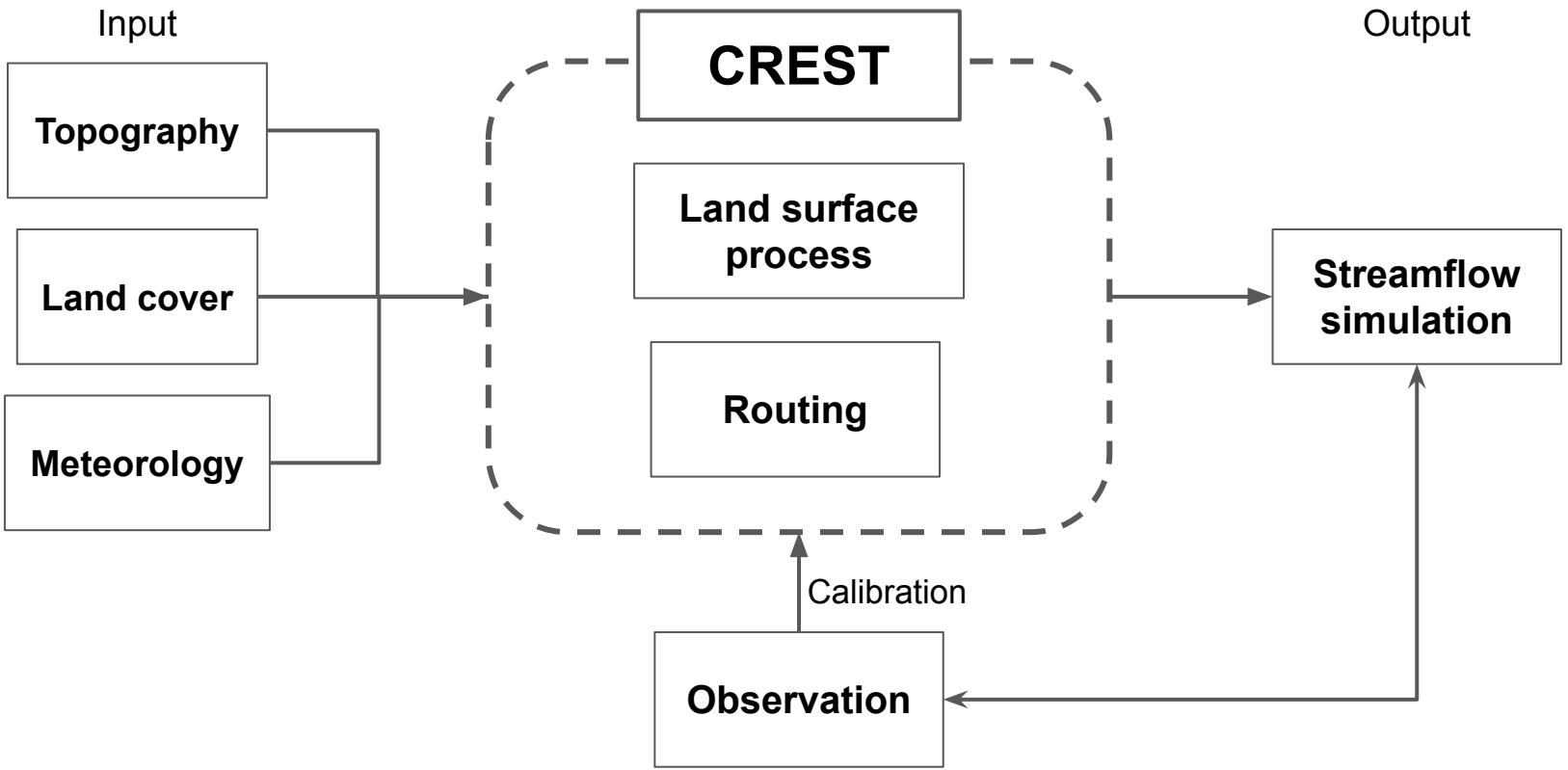
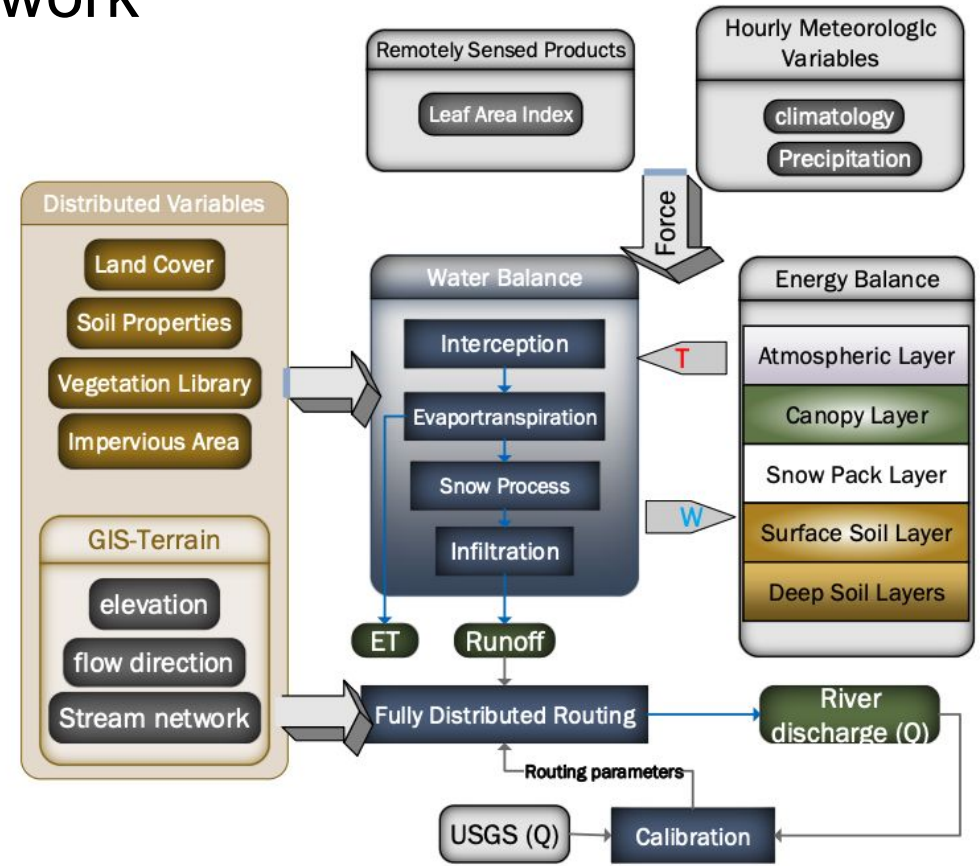
Overall framework



Detailed framework



Interface and structure of the model consisting of a runoff-generation and routing component

Land surface procedure

Energy balance:

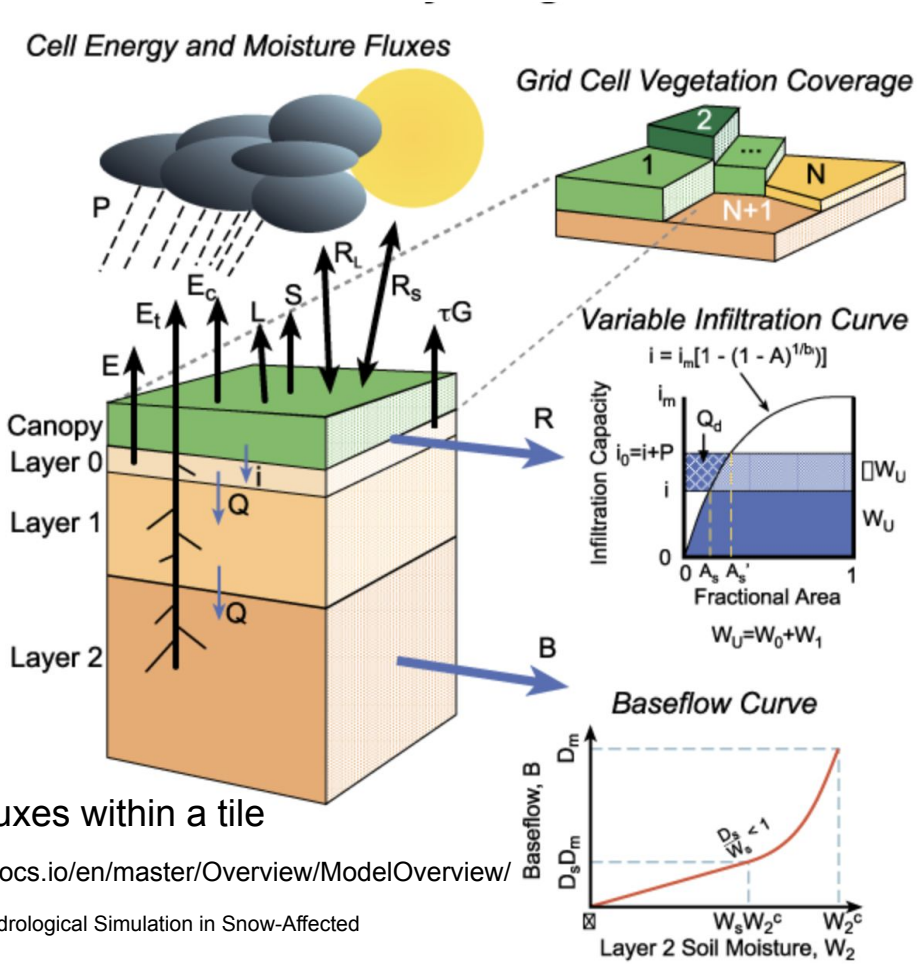
Net Radiation (Rn) - Sensible Heat Flux (H) - Latent Heat Flux (LE) - Ground Heat Flux (G) = Change in Energy Storage (ΔS)

Boundary conditions:
Air and deep soil temperatures.

Water balance:

Precipitation (P) - Evapotranspiration (ET) - Runoff (R) = Change in Soil Moisture (ΔS)

Boundary conditions:
Precipitation, soil properties, and routing parameter.

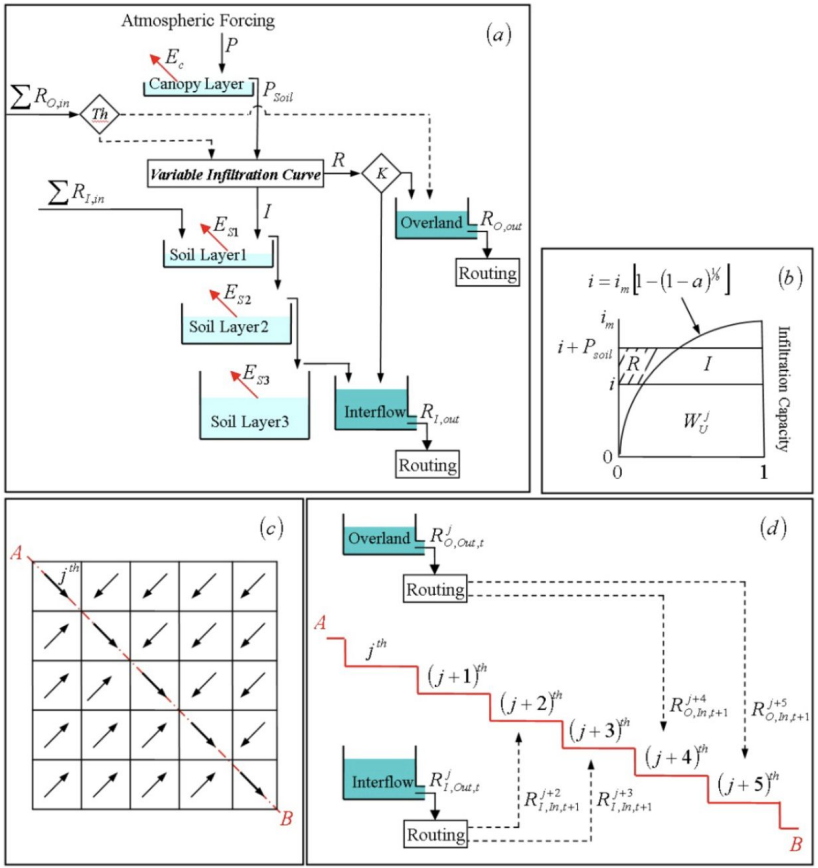


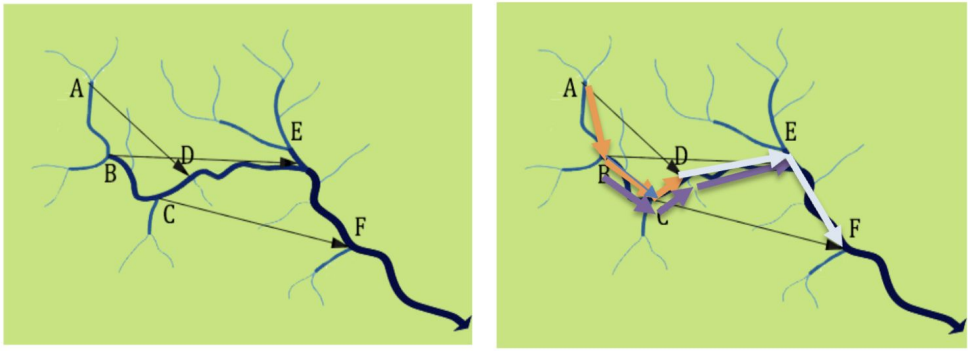
Major water and energy fluxes within a tile

Figure credit: https://vic.readthedocs.io/en/master/Overview/ModelOverview/

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.

Runoff and routing procedure

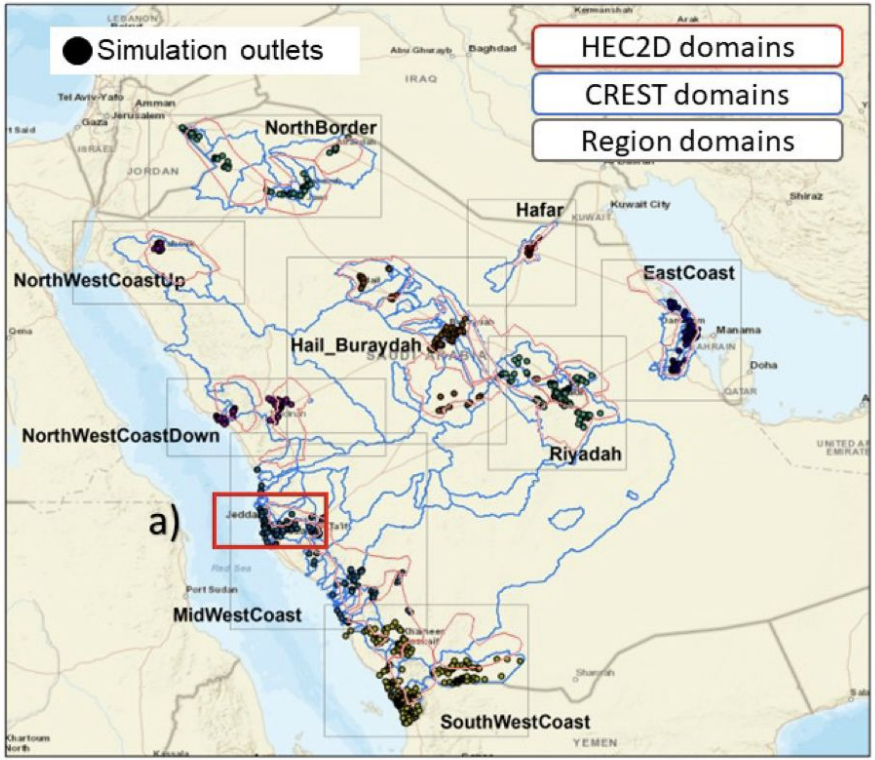




Routing conception of CREST v2.0 and v2.1. (a) Linear reservoir routing (LRR) method used in V2.0 and (b) Fully distributed linear reservoir (DLRR) used in v2.1.

Core components of the CREST model (a) Vertical profile of a cell including rainfall-runoff generation, evapotranspiration, sub-grid cell routing and feedbacks from routing; (b) variable infiltration curve of a cell; (c) plane view of cells and flow directions; and (d) vertical profile along several cells including sub-grid cell routing, downstream routing, and subsurface runoff redistribution from a cell to its downstream cells.

Shen, Xinyi, Yang Hong, Ke Zhang, and Zengchao Hao. 2017. “Refining a Distributed Linear Reservoir Routing Method to Improve Performance of the CREST Model.” *Journal of Hydrologic Engineering* 22 (3): 04016061.



The NCM flash-flood forecasting system

KEY FEATURES

- Hydrologic simulations for >100 watersheds
  - Hourly discharge
- 2d hydraulic simulations for over 700.000 km^2
  - Flood depth at 30m resolution
  - 2.5m resolution over critical areas
- 4 times a day
- 120 hours forecast

Output: Flood hydrograph