# Evaluating hyper-resolution global hydrology by comparing spatial and temporal resolutions

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## Introduction

Global hydrological models have transitioned from global scale to hyper-resolution (5 arc minutes or less).

Benefits:
- Greater applicability for stakeholders (e.g., comprehensive flood prediction)
- Better understanding of hydrological system

Challenges[1,2,3,5]
- Scaling issues that require explicit spatial modelling and parameterized processes
- Require lateral connections between compartments of the hydrological system
- Increased uncertainty from insufficient parameter data quality

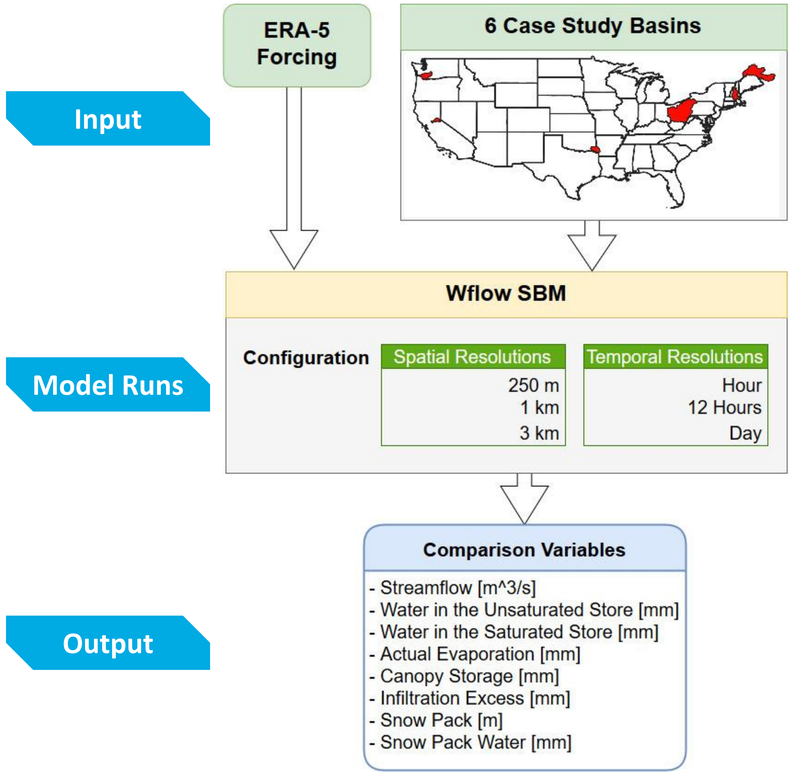
### Guiding Question

How is the hydrological model Wflow SBM impacted by changes in spatiotemporal resolutions?

### Project Goal

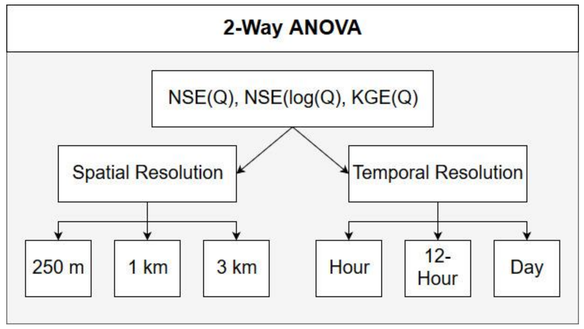
Evaluate hyper-resolution global hydrology using the Wflow SBM model[4] and the eWaterCycle II platform

## Intra-Model Comparison Setup




## Analyses

**Streamflow Validation (USGS) and statistics:**

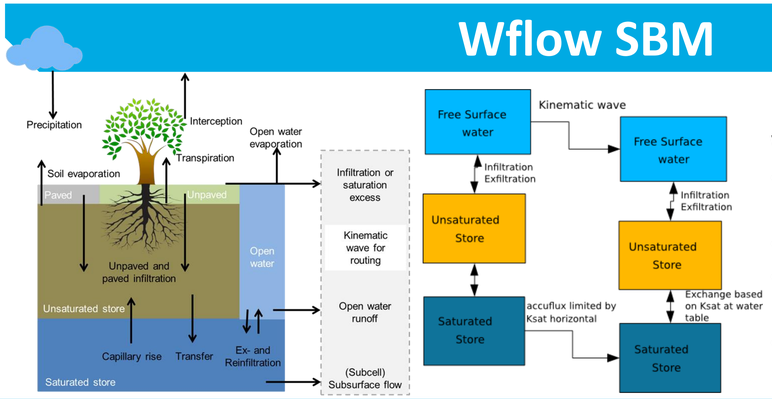



**State Comparison**

$$\Delta = \sqrt{\frac{1}{T}\sum_{t=1}^{T}\sum_{s=1}^{S}\left(\frac{W(t,s)-w(t,s)}{W(t,s)}\right)^2}$$

$T$ : Total of time series
$S$ : Total of basin grid cells
$W$ : Sum of coarse resolution grid cells
$w$ : Sum of high resolution grid cells

## Wflow SBM




**Why Wflow SBM?**
- Physically based distributed hydrological model
- Can run with any time step
- Spatial distribution within the hyper-resolution domain
- No calibration required

## Going Forward

**Next steps:**
- Include: soil moisture and snow pack validation, global basin, multiple global hydrological models
- Perform benchmark testing
- Compare the effect of different precipitation products

**Share your thoughts on:**
- Explicit spatial hydrological modelling on high spatial resolutions
- Effects of higher temporal resolutions on comparison variables

References:
[1]Beven and Cloke ,2012: Comment on “Hyperresolution global land surface modeling: Meeting a grand challenge for monitoring Earth's terrestrial water” by Eric F. Wood et al.
[2]Bierkens et al., 2015: Hyper-resolution global hydrological modelling: what is next?
[3]Melsen et al., 2016: HESS Opinions: The need for process-based evaluation of large-domain hyper-resolution models
[4]Samaniego et al., 2017: Toward seamless hydrologic predictions across spatial scales
[5]Wood et al., 2011 : Hyperresolution global land surface modeling: Meeting a grand challenge for monitoring Earth's terrestrial water