Global SWOT Data Assimilation of River Hydrodynamic Model
the Virtual SWOT Observation Test using CaMa-Flood
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1. Introduction
Global River Model has error due to
- inaccurate input (Land Surface Runoff)
- incomplete river model implementation

Improve accuracy with Data Assimilation

Data Assimilation
- process to reduce error at the model
- done by merging Observation Data with
Model Estimation
- maintain physical consistency

2. Model + Satellite Data

Model: CaMa-Flood (Catchment-Based Macro-scale Floodplain)
- global river hydrodynamics model for large scale rivers
- computing in 25 km grid
- high speed and realistic estimation by parameterizing high resolution DEM terrain information
- can calculate Water Surface Height

Input: Land Surface Runoff
- amount of precipitation water running out from the grid
- obtained from Land Surface Model

Major Output: Discharge
- amount of water flowing down the river
- many other outputs are also available in p. Water Storage, Water Surface Height

Observation: SWOT (Surface Water and Ocean Topography)
- next generation satellite altimeter for water surface
- can observe water bodies within 120km swath
- 22 day return period (observation available once in 6–10 days due to its orbit)
- launch scheduled in April 2021

4. Result + Discussion

Assimilation Index

General Discussion
- Accuracy of Discharge is improved at most major river’s mainstream
- Assimilation Index (AI) is high at high latitude
  - due to high observation frequency
  - AI is high at downstream of the rivers

Upstream
- AI rises when SWOT observation is available

Downstream
- Discharge Improvement rely on Propagation of Assimilation Effect from upstream

5. Extra Experiment
- Extra Experiment using Runoff of different year (no Bias)
  - Assimilated Sim.: Runoff of 1990 + Assimilation
  - Nash Sutcliffe coefficient (NS) is calculated for both
    Non-Assimilation experiment and Assimilated experiment

NS = 1 - \( \sum \frac{(Obs - Sim)^2}{(Obs - Mean)^2} \)

Mainstream in high latitude rivers or Downstream are relatively well assimilated

Data Assimilation allow pretty well Simulation even with very low accurate Runoff Forcing

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