River run-off to the ocean: JRA-55 + CaMa-Flood

River model: "Catchment-based Macro-scale Floodplain model" (CaMa-Flood; Yamazaki et al. 2011[#])

Forcing: Run-off from a land surface model of JRA-55

- ✓ Production
  - CaMa-Flood will be run operationally near-real time
  - Run-off of JRA-55 is adjusted relative to Dai et al. (2009)
- ✓ River run-off data
  - Horizontal resolution : 0.25° x 0.25°
  - Time interval : daily
  - Unavailable around Antarctica:
    - → Time-invariant, annual mean climatology taken from CORE
    - → Monthly climatology of iceberg melt by Merino et al. (2016)
- ✓ Support data for mapping to the ocean model grid are also provided

[#)] Yamazaki, D., S. Kanae, H. Kim, & T. Oki (2011): A physically-based description of floodplain inundation dynamics in a global river routing model. Water Resour. Res. 47, W04501, doi:10.1029/2010WR009726

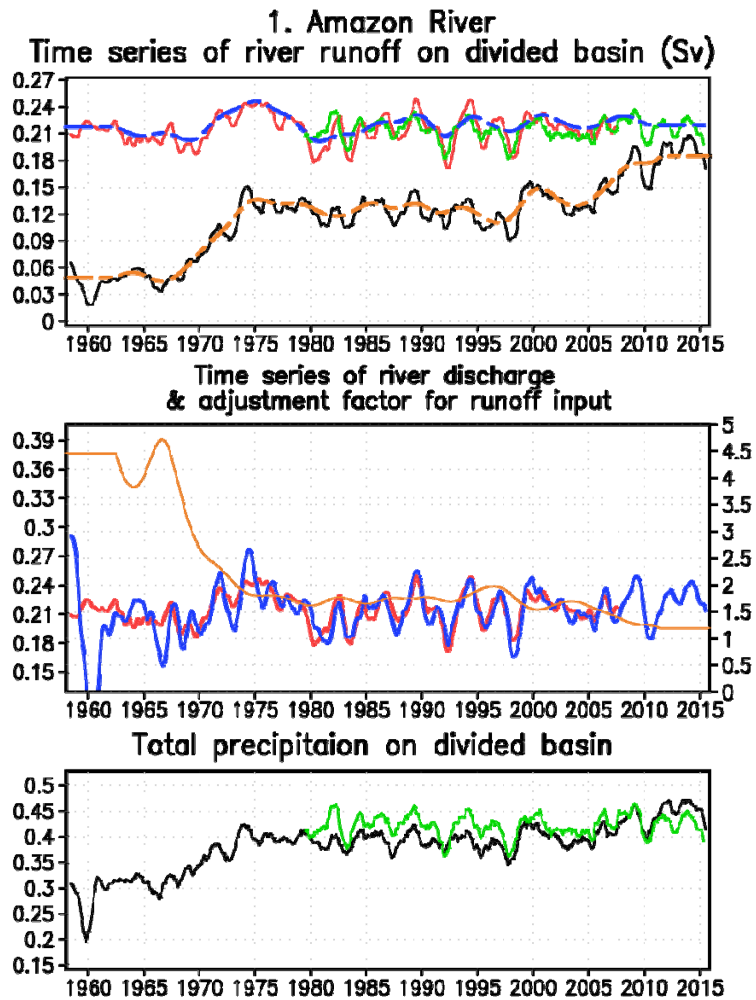
Adjustment on run-off data

1. <u>Interannual time-scale</u>

For major 39 rivers and 6 rivers with vast basin, a low-pass filtered (5-yr Lanczos window) JRA-55 run-off from land (orange and black in the top panel) is adjusted to fit with the river discharge of Dai et al. (2009). Remaining basin-wise input (to the small rivers) is adjusted in the same way

2. <u>Seasonal time-scale</u>

For major 39 rivers, width and depth are tuned so that climatology of seasonal variability fits with Dai et al. (2009).

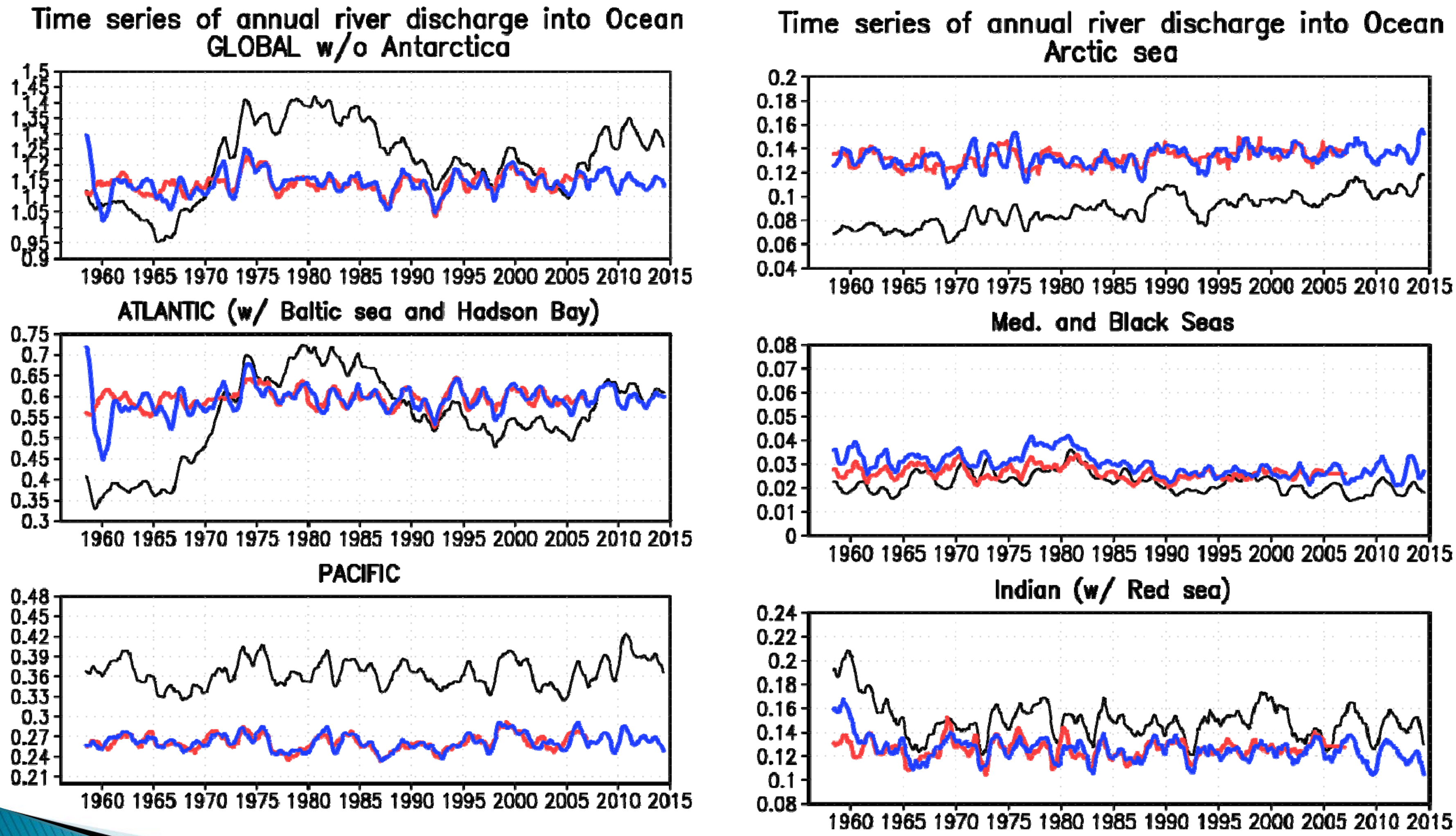


(Upper panel) (black) Run-off to the river from land of JRA-55. (orange) Low-pass filtered by 5-yr Lanczos window. (Red) River run-off to the ocean by Dai et al. (2009). (Green) Regressed river run-off to the ocean based on comparison between Dai et al. (2009) and GPCP. (Blue) Low pass filtered by 5-yr Lanczos window.

(Middle panel) (blue) River run-off to the ocean calculated by CaMa-Flood with the adjusted input. (Red) River run-off to the ocean by Dai et al. (2009). (Orange) correction (multiplicative) factor ($0.2 < f < 5.0$) applied to the JRA-55 river run-off from land used as an input

(Lower panel) Precipitation on divided basin (black: JRA-55, green: GPCP)

Interannual variability of basin-wise river run-off to the ocean (Units: Sverdrups)



black: w/o adjustment, blue: after adjustment, red: Dai et al. (2009)

Support data for mapping river run-off data to ocean model grid

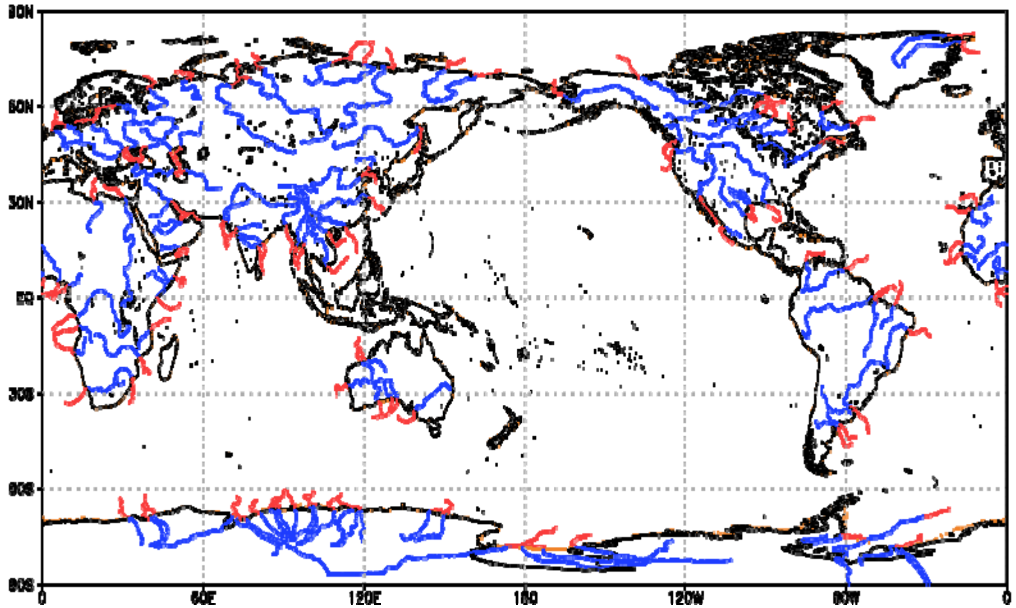
<u>Two Support data</u>

- Flow direction of river (1/60 x 1/60) (flwdir.bin)

  This gives the downstream (next) grid point by index (N=1, NE=2, E=3,..., NW=8) starting from the headwater

- Headwater position for river run-off to the ocean (1/4 x 1/4) (waterhead_xy.bin)

  This gives position (x,y) on 1/60 x 1/60 degree grid of the headwater for the grid point where non-zero river run-off to the ocean exist.



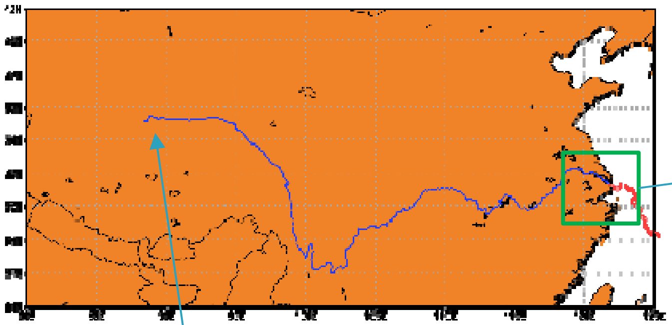
(Blue) Main flow path of the rivers longer than 1000 km.
Red line is the extension to the sea.

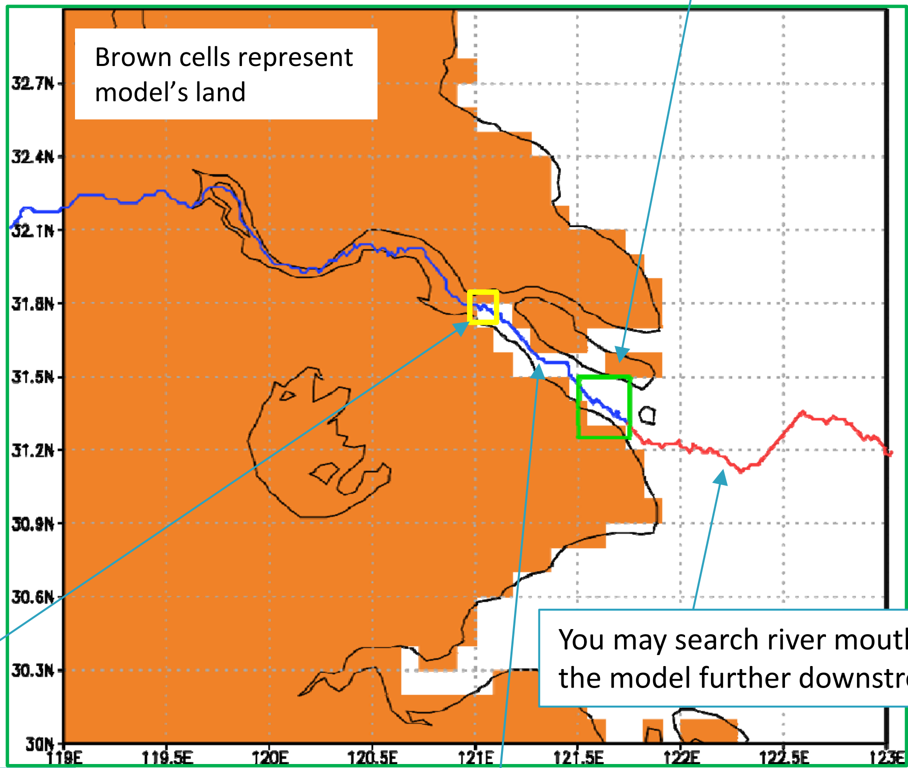
Example on the detection of river mouth

Method: Search the flow path of a river downstream from its headwater.
The first intersection with the model's coast line is decided to be the river mouth.

Yangtze River (Chang Jiang) example

Non-zero value of the river run-off data set (only at the mouth of the river, but not necessarily at the model's)





Trace the flow path from headwater.

You may search river mouth for the model further downstream

The first intersection between the path and the model's coast line is determined to be the river mouth of the model, where run-off data should be given.

Searching upstream sometimes does not give good results. Instead, river flow path is traced from the headwater downstream.