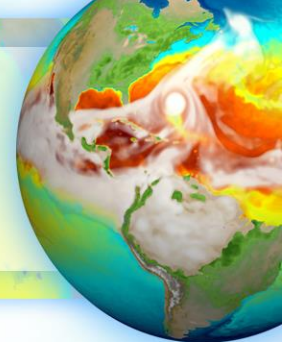


Same lat-lon grid for land and river models



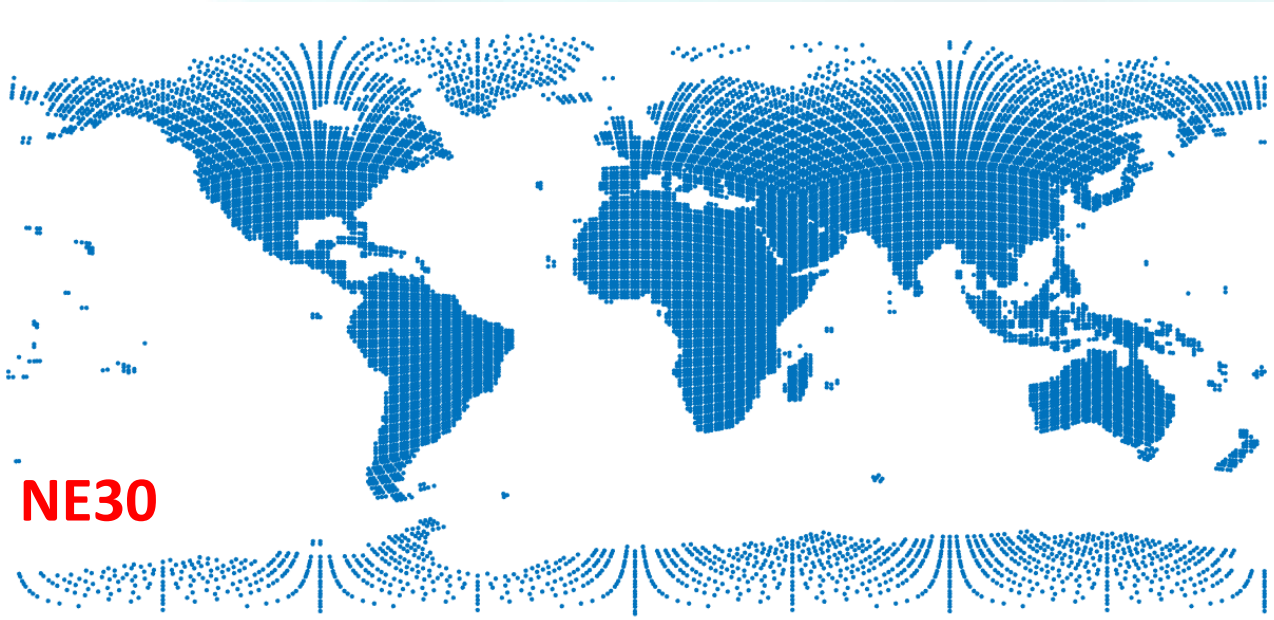
Tian Zhou

Pacific Northwest National Laboratory

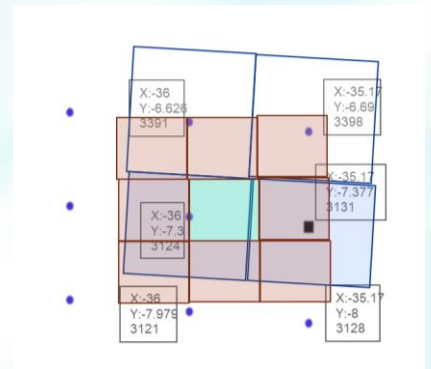
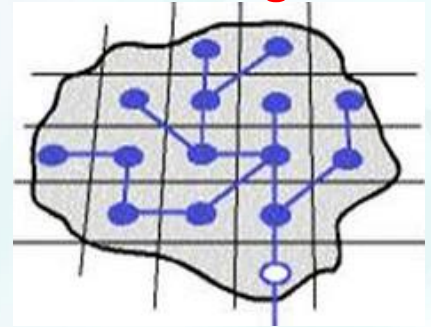
Current land and river grids

Land: Spectral Element grid, which is consistent with the atmosphere model

River: Latitude – longitude grid



0.5 deg



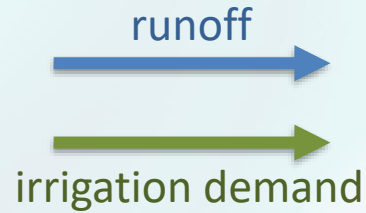
Issues with this setup

1-way coupling

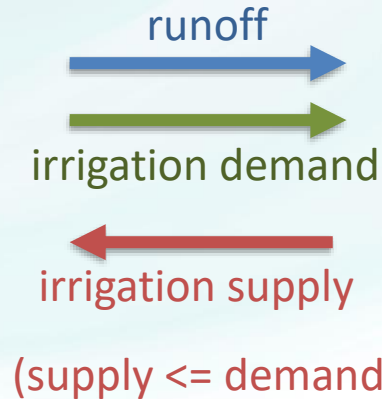


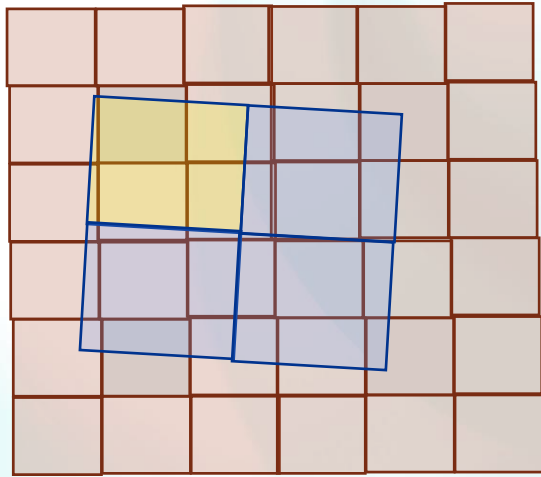
Issues with this setup

1-way coupling

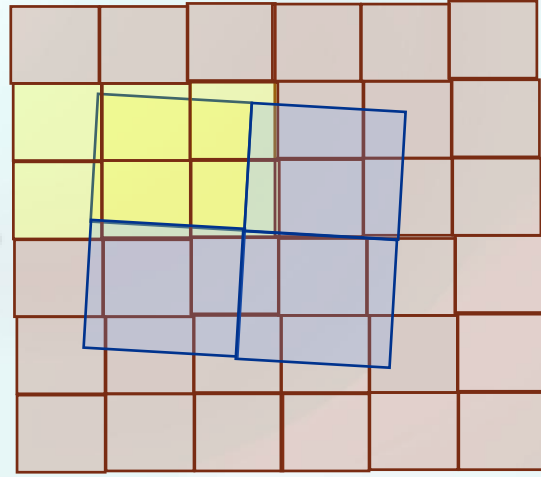


2-way coupling

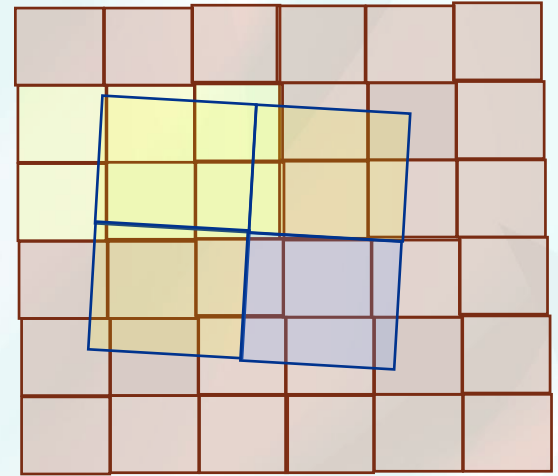




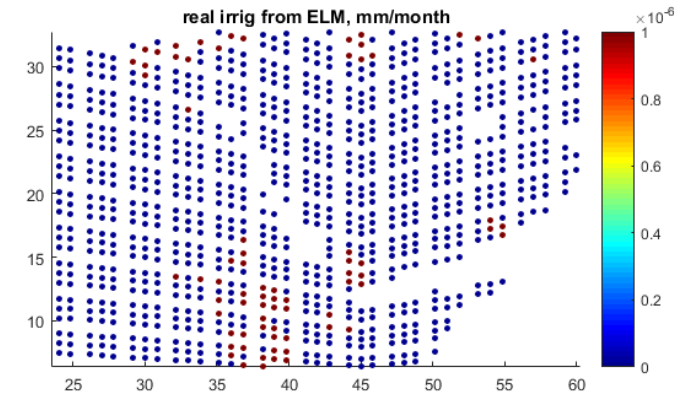
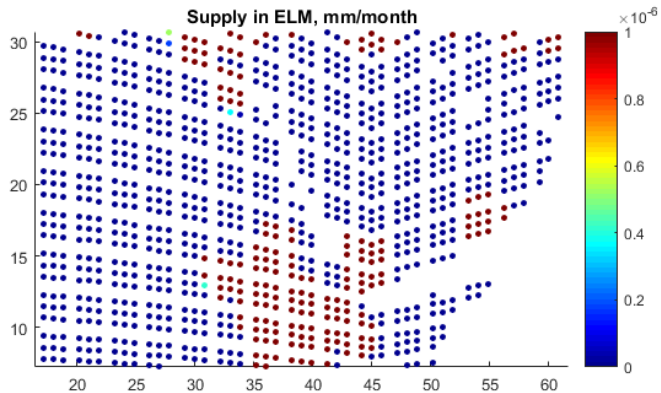
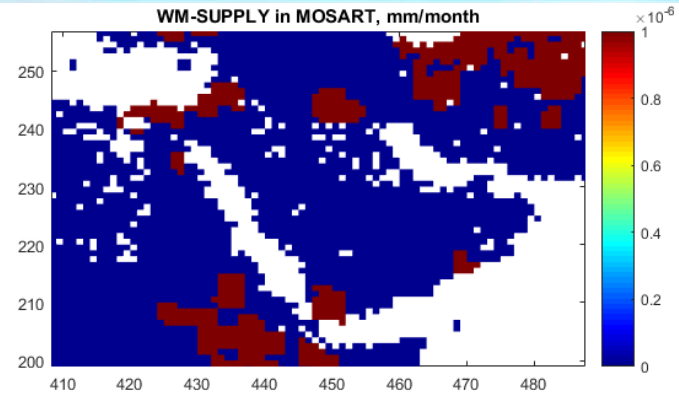
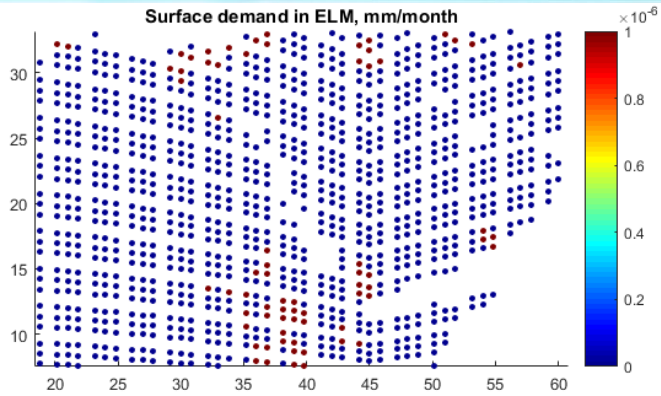
One ELM grid needs irrigation



Six MOSRT grids receive information and provide supply

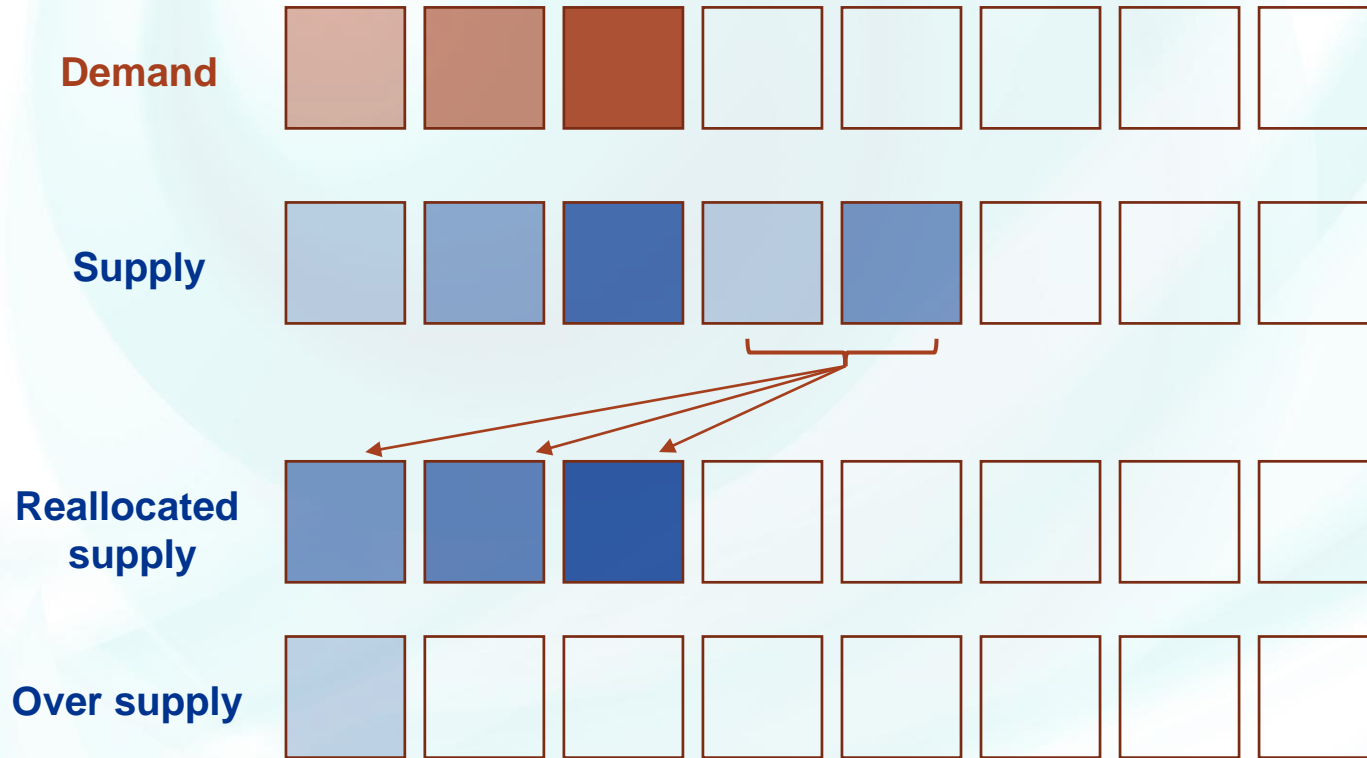


Three ELM grids receive irrigation supply



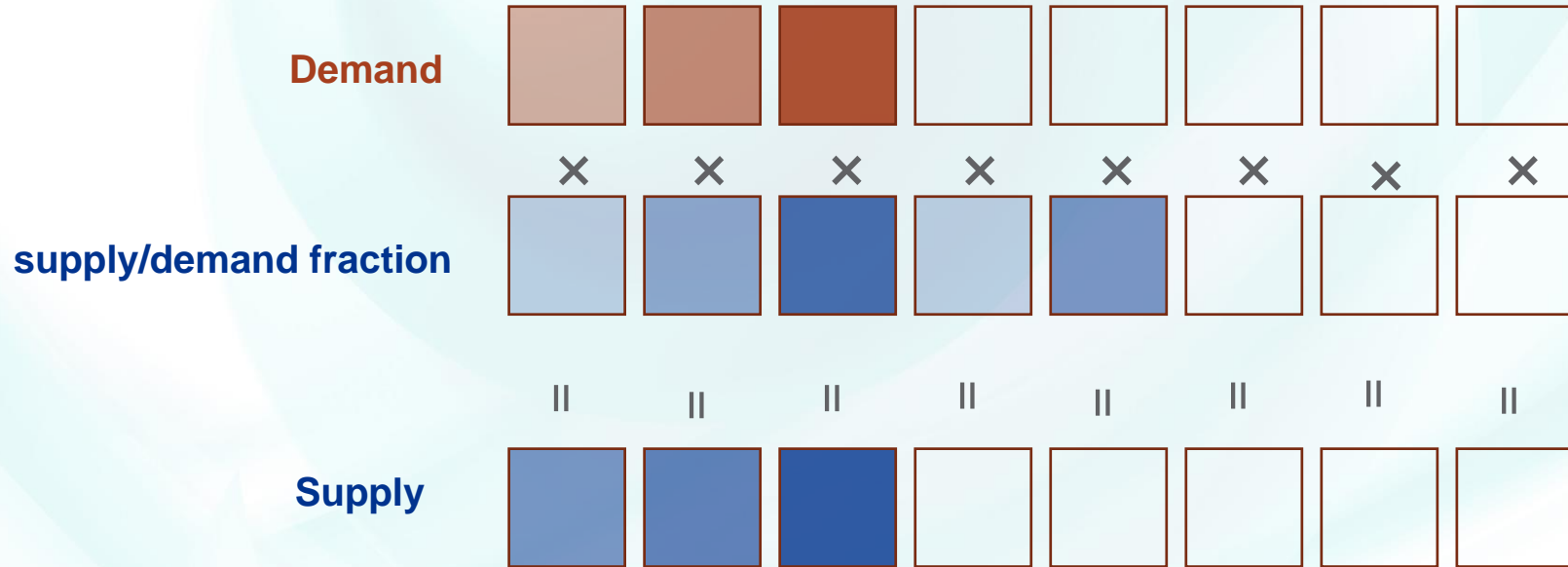
- 3049 ELM grid cells have supply but only 1470 (48%) need irrigation
- 13% (volume) of supply water not applied correctly

Workaround 1: reallocate irrigation supply in ELM



After relocation, 100% of supply water will be applied
However, the water relocation is arbitrary, can't pass the b4b test

Workaround 2: passing fraction instead of flux



issue: ELM (0.5 hr) and MOSART (3 hr) are not running at the same time step and irrigation only applied for 4 hrs. There's a time lag in supply and demand

Ultimate solution: same grid

Discussion ([page link](#))

Ruby Leung, Chris Golaz, Rob Jacob, Peter Thornton

Ben Bond-Lamberty, Kate Calvin, Tony Craig, Gautum Bisht, Teklu Tesfa ...

Advantages:

- Solve this mapping problem.
- All land-related models share the same grid.
- ELM-MOSART-WM can all be run at higher resolution than the atmosphere, which is useful to better resolve land surface heterogeneity.

Disadvantages:

- land surface temperature field will "see" resolution of atmosphere (grid imprinting).
- Reconcile land-sea mask

Attempts made

Using ne30 ATM data to drive lat-long grid ELM and MOSART

Grid: hcru_hcru --compset IMCLM45

Update the mapping file links in env_run.xml

Update the 720*360 ELM surface data

Efforts needed

- ELM surface data for lat-long resolution
- New irrigation fraction map at lat-lon grid: may not need big effort as the original dataset from FAO Global Map of Irrigation Areas (GMIA) is also lat-lon based.
- Initial condition (ideally from spun-up state).
- Land use land cover change (for transient forcing and consistent with surface properties).
- Testing
-

Discussion

- Would future E3SM configurations always use a common lat-lon grid for ELM and MOSART? Or do we want to maintain the option of using different grids, thus creating more use-cases that will break and require support and maintenance.
- Implications for RRM: should we always use a higher resolution lat-lon ELM and MOSART grid to match the resolution of the refined region? Or do we need true RRM capability on the land side?
- In terms of reconcile land-sea mask, would we have to generate new land and river files every time the ocean or atmosphere grids change?