Hydrology

Presented by

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Geophysical Fluid Dynamics Laboratory Review

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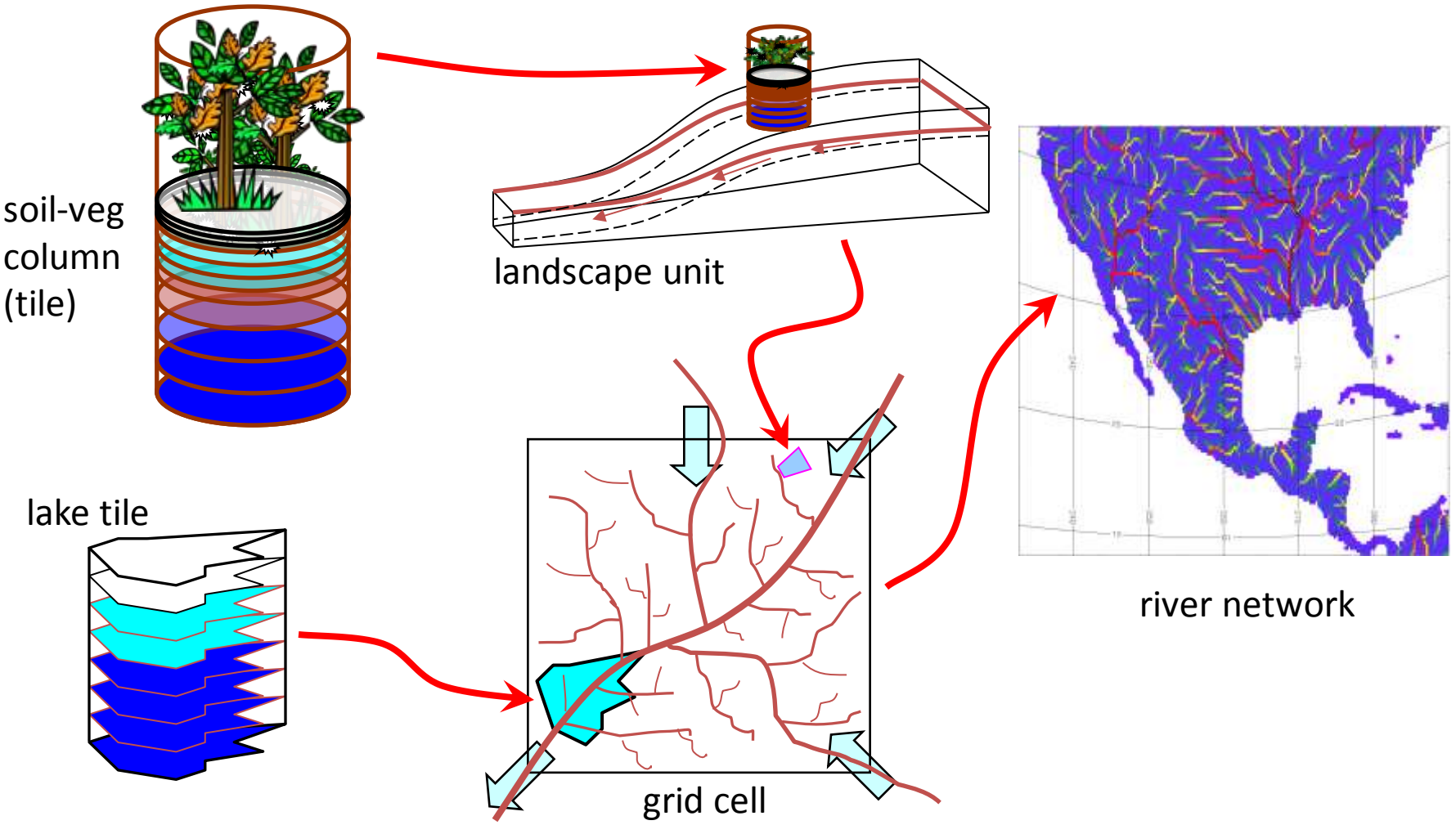
Hydrology: Preview

① Land model LM3, used in all GFDL CMIP5 streams, contains new physical/hydrologic features that

- improve fluxes to atmosphere and oceans;
- support terrestrial biogeochemical modeling;
- represent impact-relevant hydrologic variables (streamflow, lake levels, water table).

② A focus on potential evapotranspiration (PET) helps reconcile conflicting projections of water availability and drought.

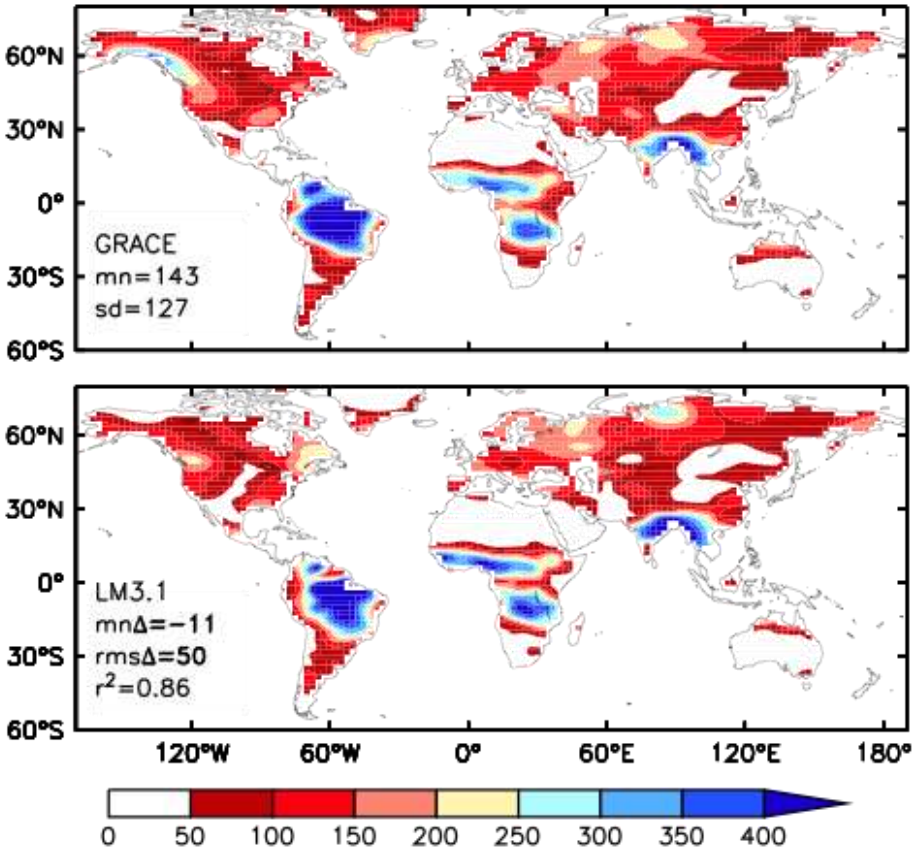
LM3 Hydrology: Features



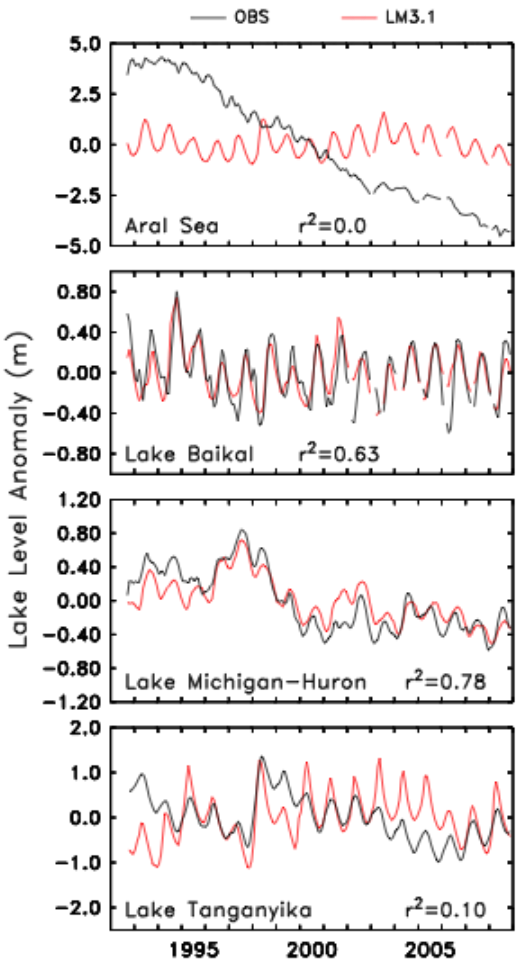
LM3 Hydrology: Stand-Alone Evaluation

LM3 storage variables compare well with observations.

annual range of water storage (mm)



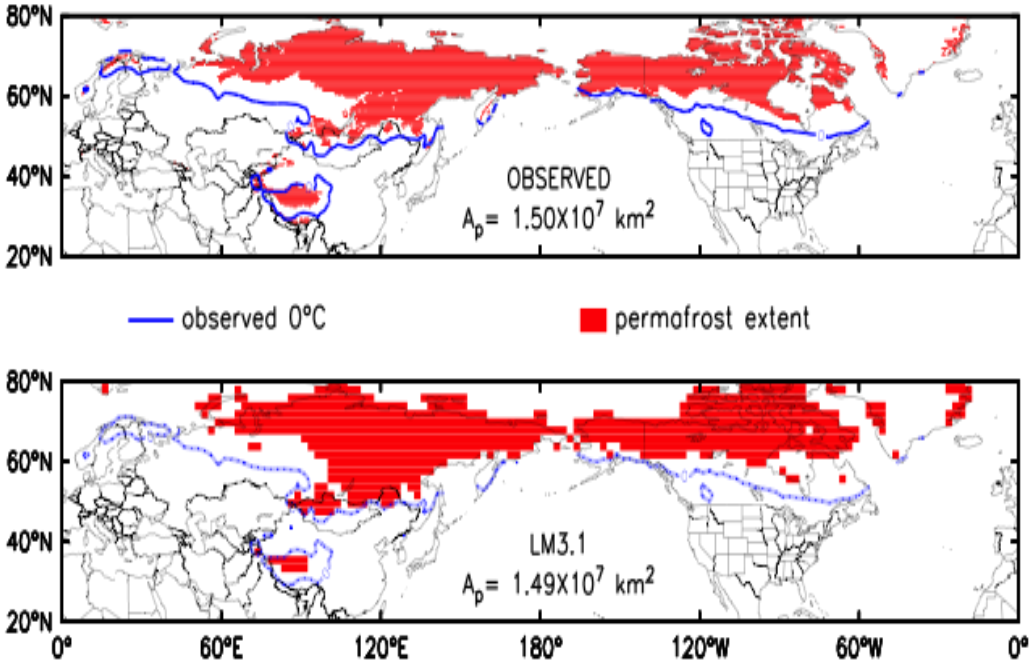
lake levels



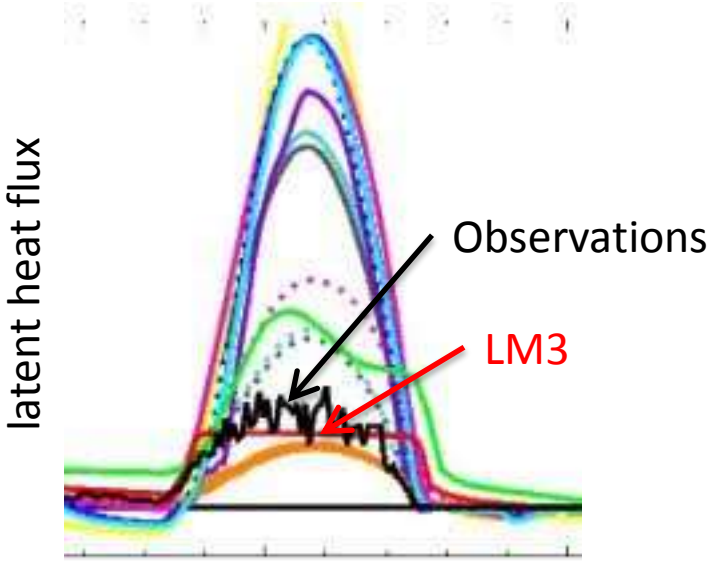
LM3 Hydrology: Evaluation

LM3 reproduces permafrost extent well.

permafrost extent



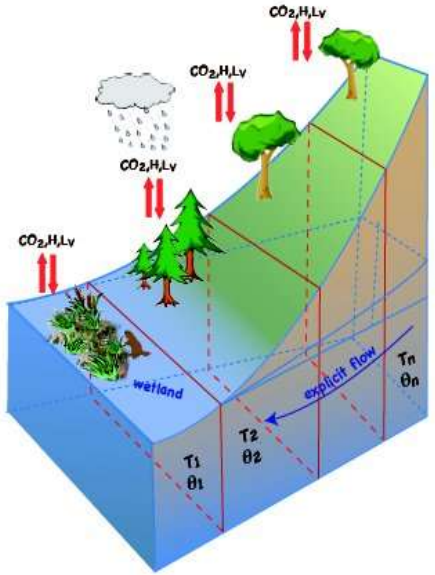
DICE: Diurnal Land/Atmosphere Coupling Experiment



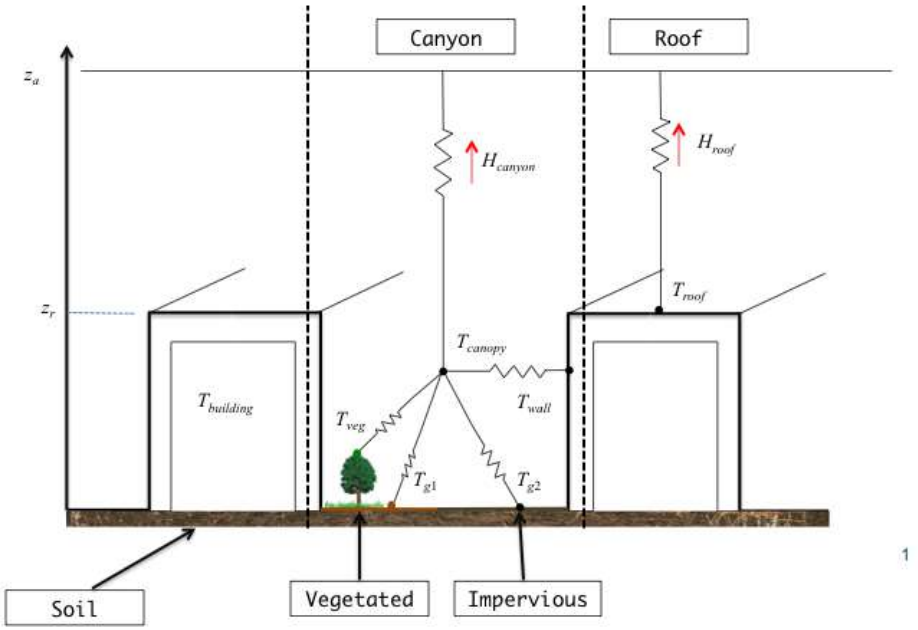
(credit: Adrian Lock, Martin Best)

Work in Progress: Toward LM4

Hill-slope tiling (Subin)



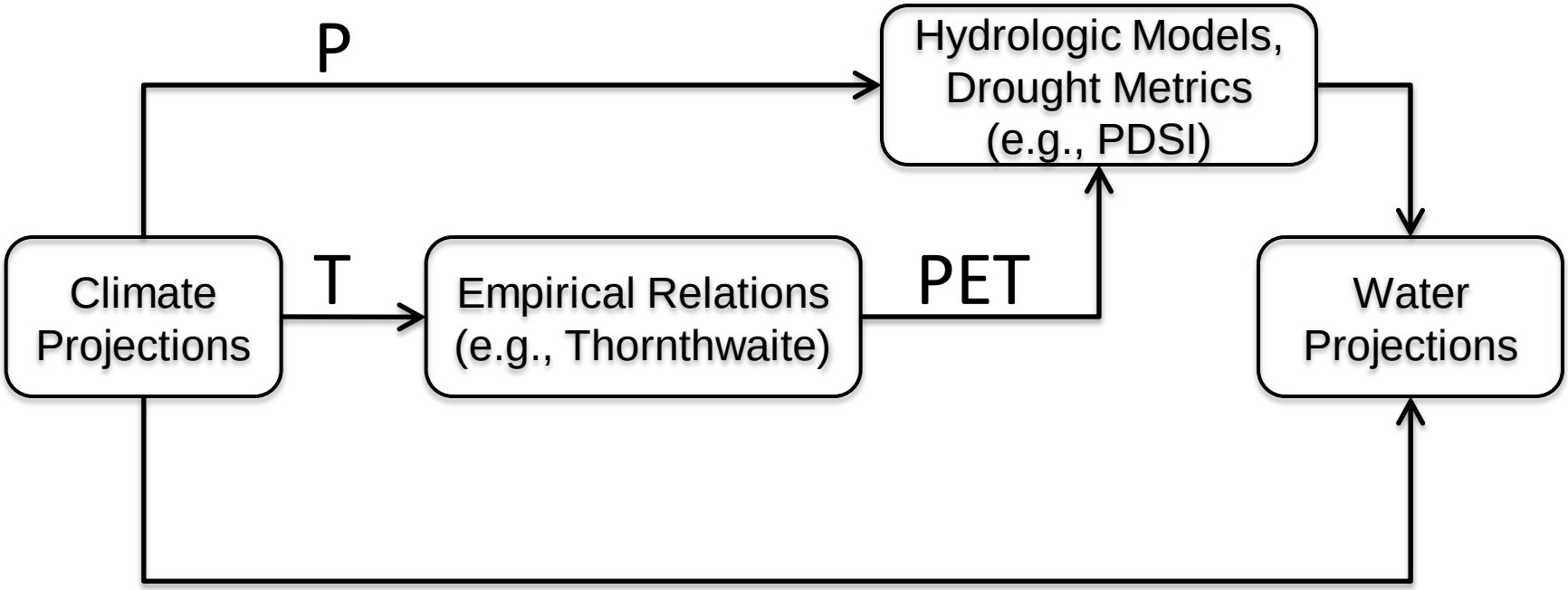
Urban tiling



+ Higher Resolution
+ Biogeochemistry (Shevliakova)

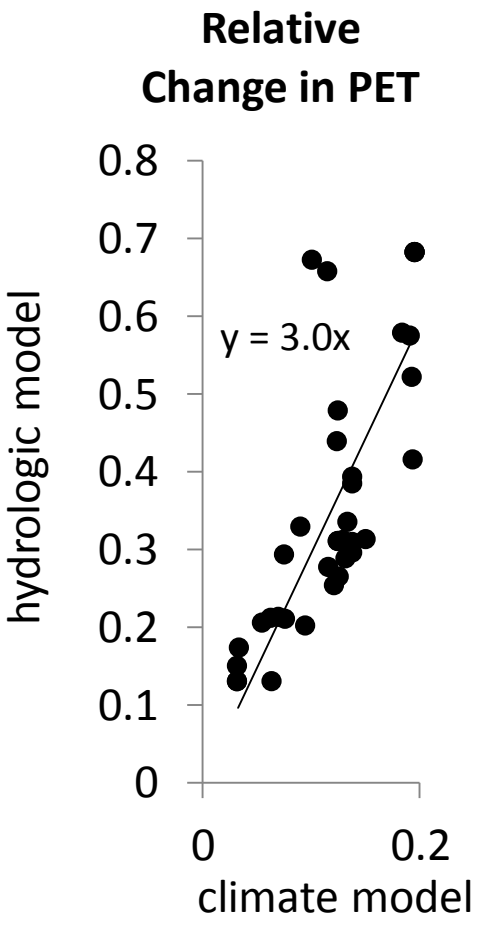
Potential Evapotranspiration

Many hydrologic impact analyses have PET as a pivotal link:



Potential Evapotranspiration

- In a case study, PET change had been overestimated by a factor of ~3 vs. that implicit in the climate model.
- Substantial negative bias in runoff change results.
- SREX→AR5: "AR4 conclusions regarding global increasing drought since the 1970s were probably overstated."



(after Milly and Dunne [2011])

Hydrology: Recap

① Land model LM3, used in all GFDL CMIP5 streams, contains new physical/hydrologic features that

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