



Assessment of Regional Forest Disasters in Soyang Basin using RHESSys

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Simulation of Natural Resources using Regional Hydrological Ecosystem Simulation System (RHES Sys)

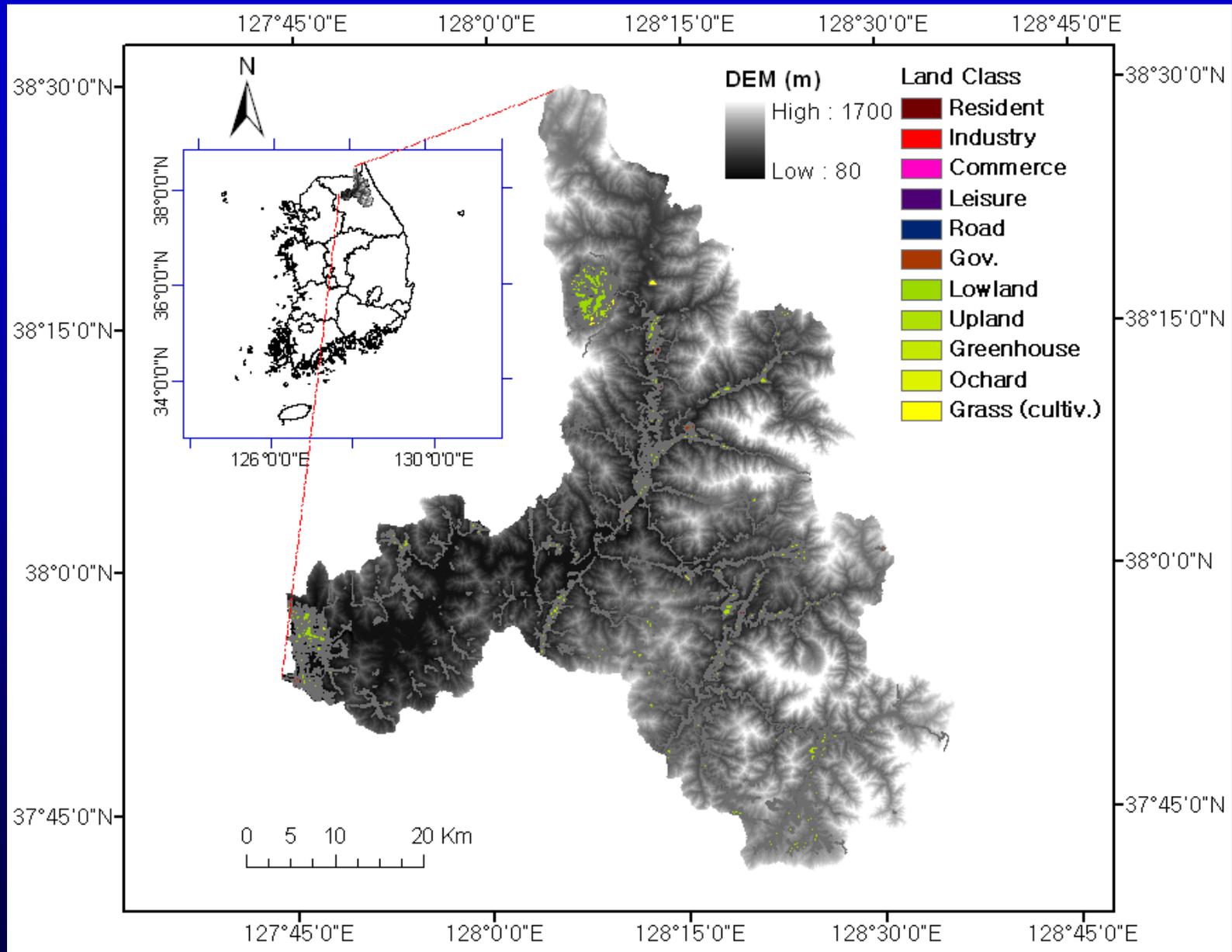
- **Development of Forest Environmental Information Simulation System (FEISS) to Forecast Forest Disasters Potentially Influenced from Climate Change**
- **Simulation of Natural Resource Use of a Complex Terrain (Haean Basin)**

Development of Forest Environmental Information Simulation System (FEISS) to Forecast Forest Disasters Potentially Influenced from Climate Change

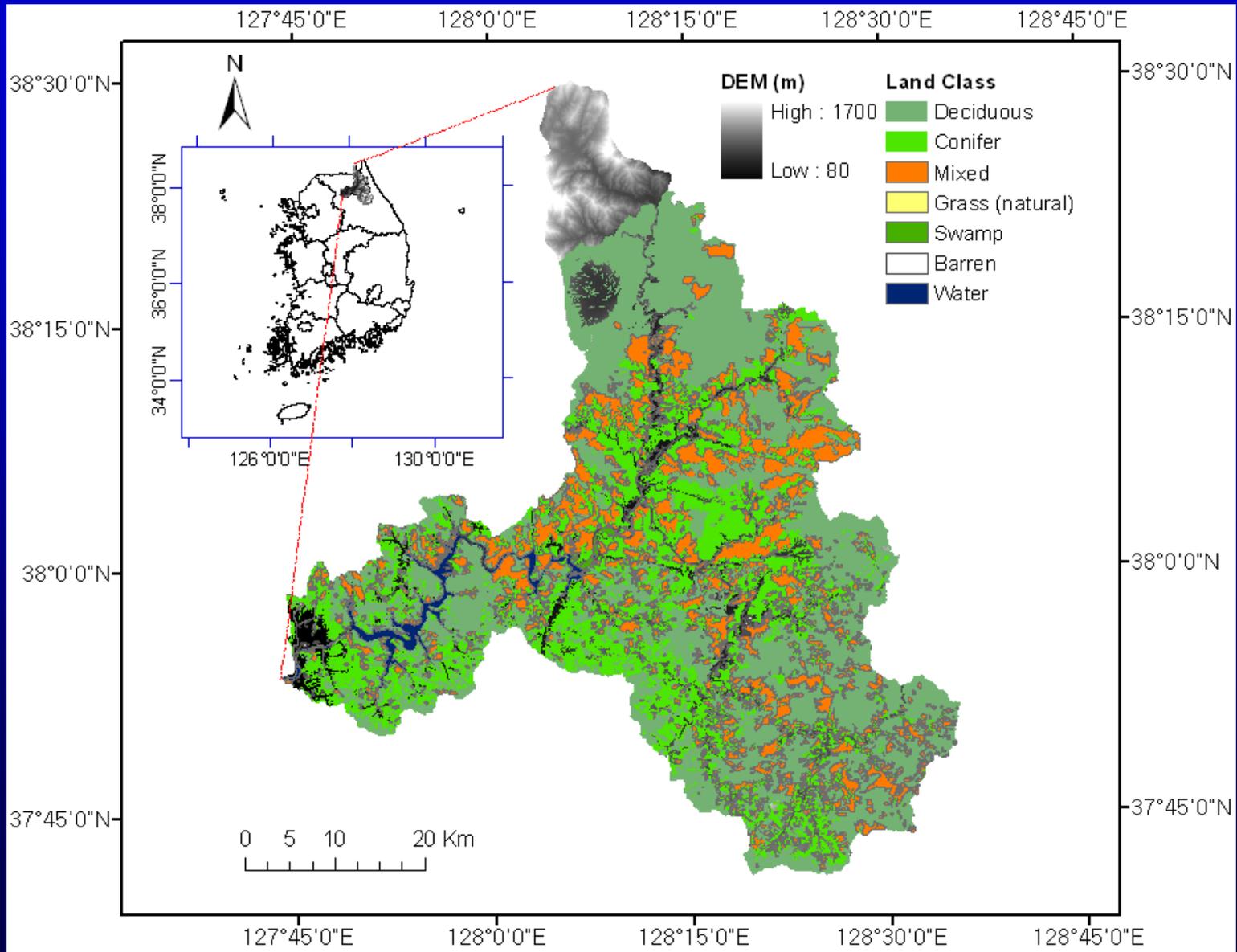
Develop a FEISS for sub-basins (e.g., Inbuk and Narincheon) in the Soyang basin, which helps forecast and reduce forest disasters such as landslide and fire under a changing climate.

- Reproduce the forest ecosystem using RHES Sys
- Simulate potential climate anomaly/change effects on forest disaster patterns and assess forest disaster decrease methods

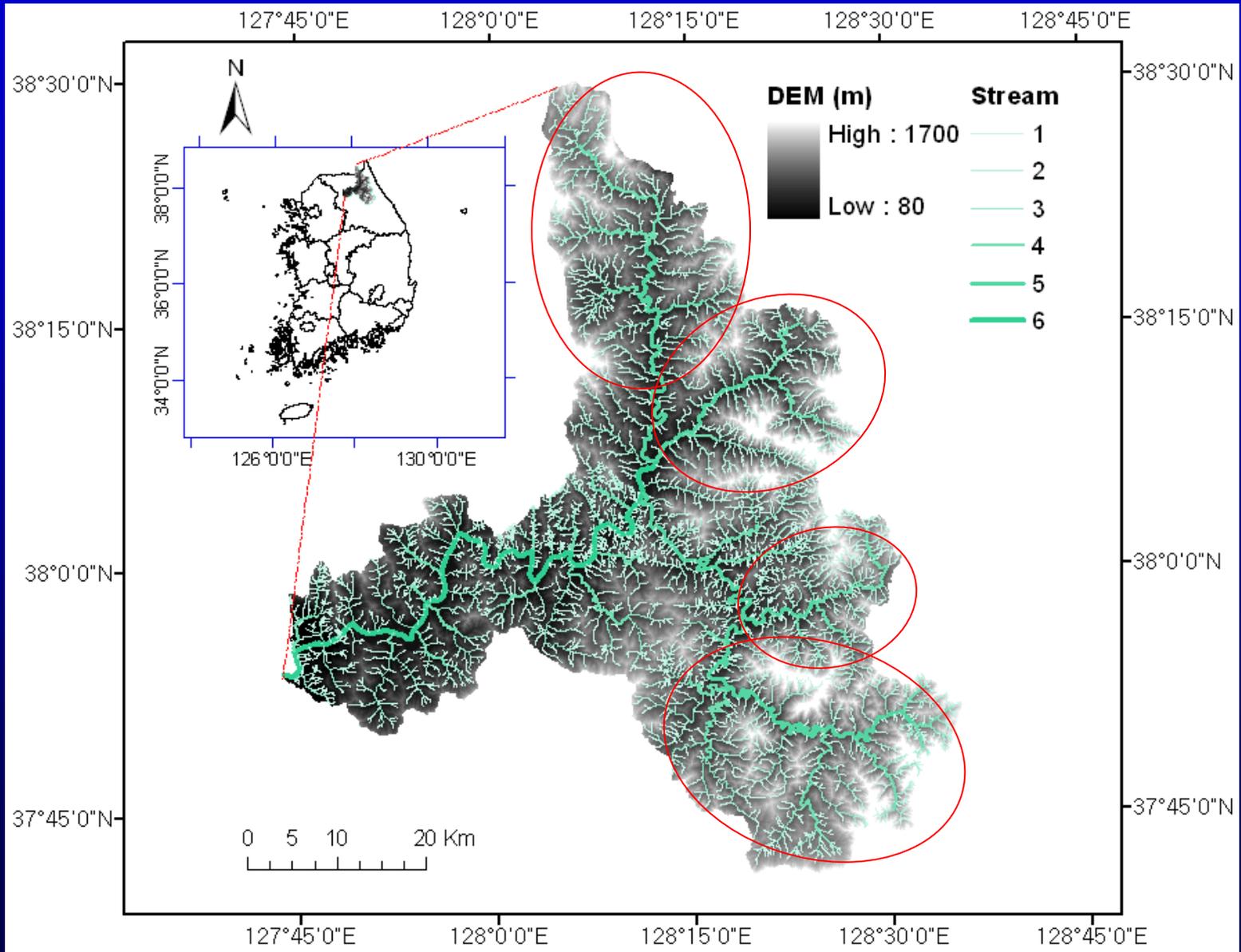
Research Site: Manmade-land Class



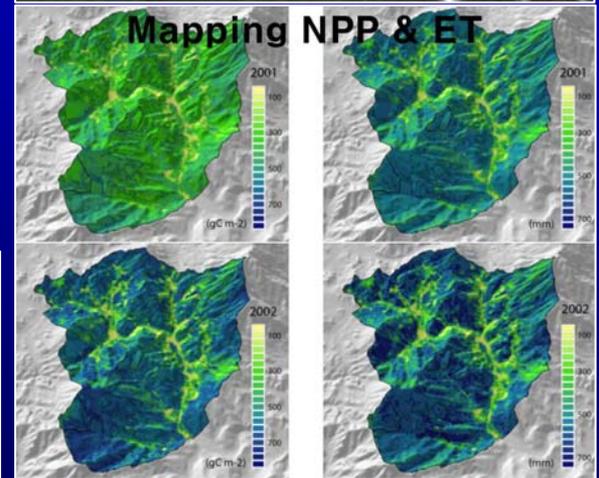
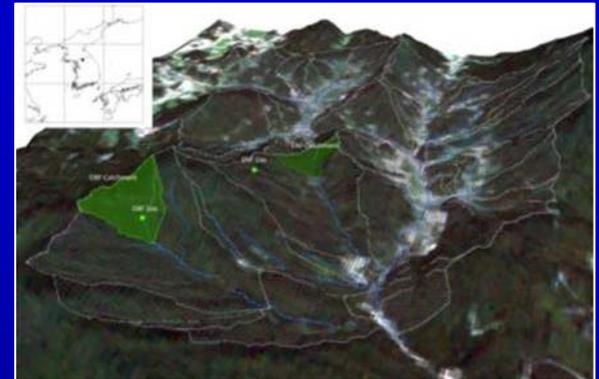
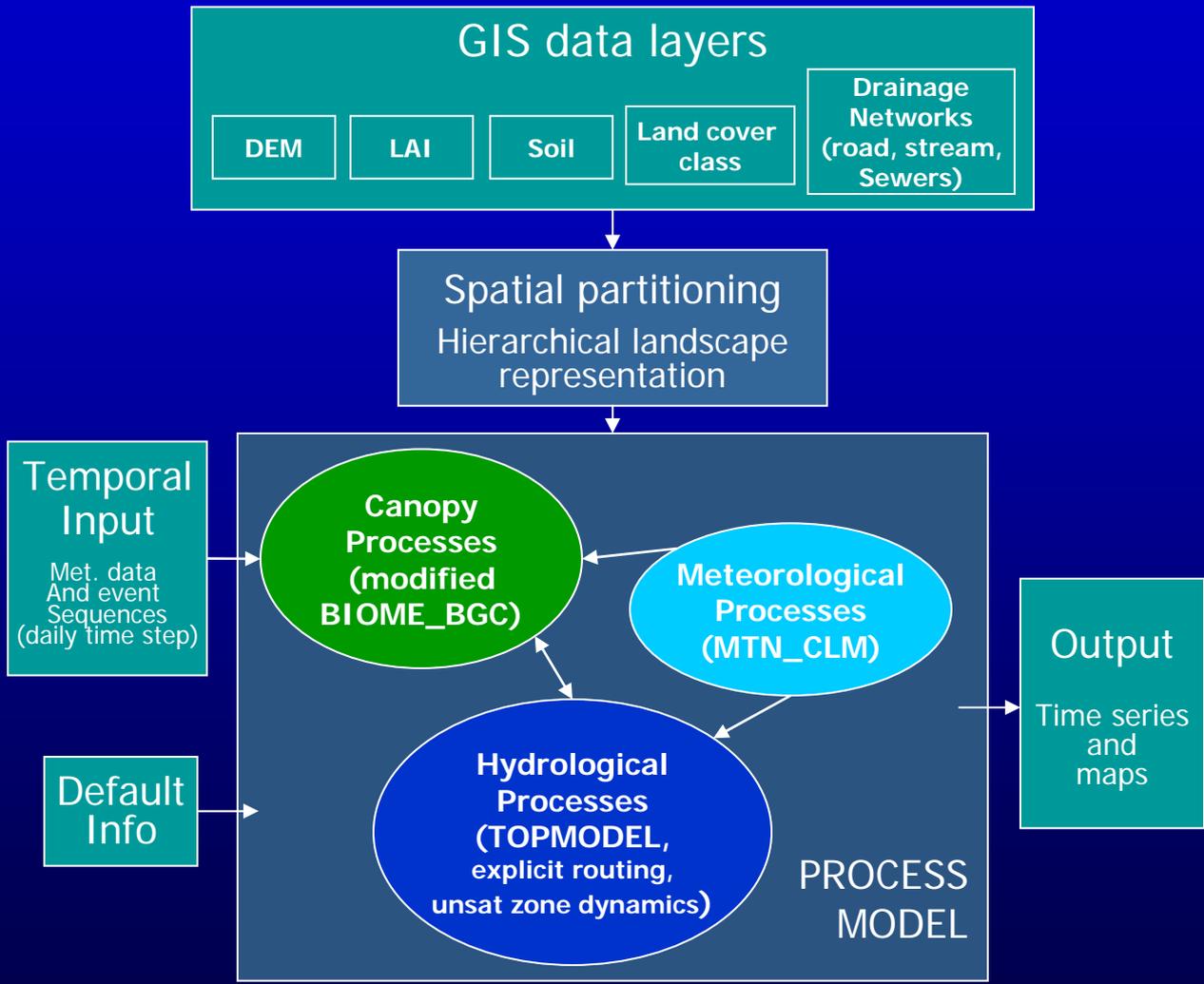
Research Site: Natural Resource



Research Site: Stream Map

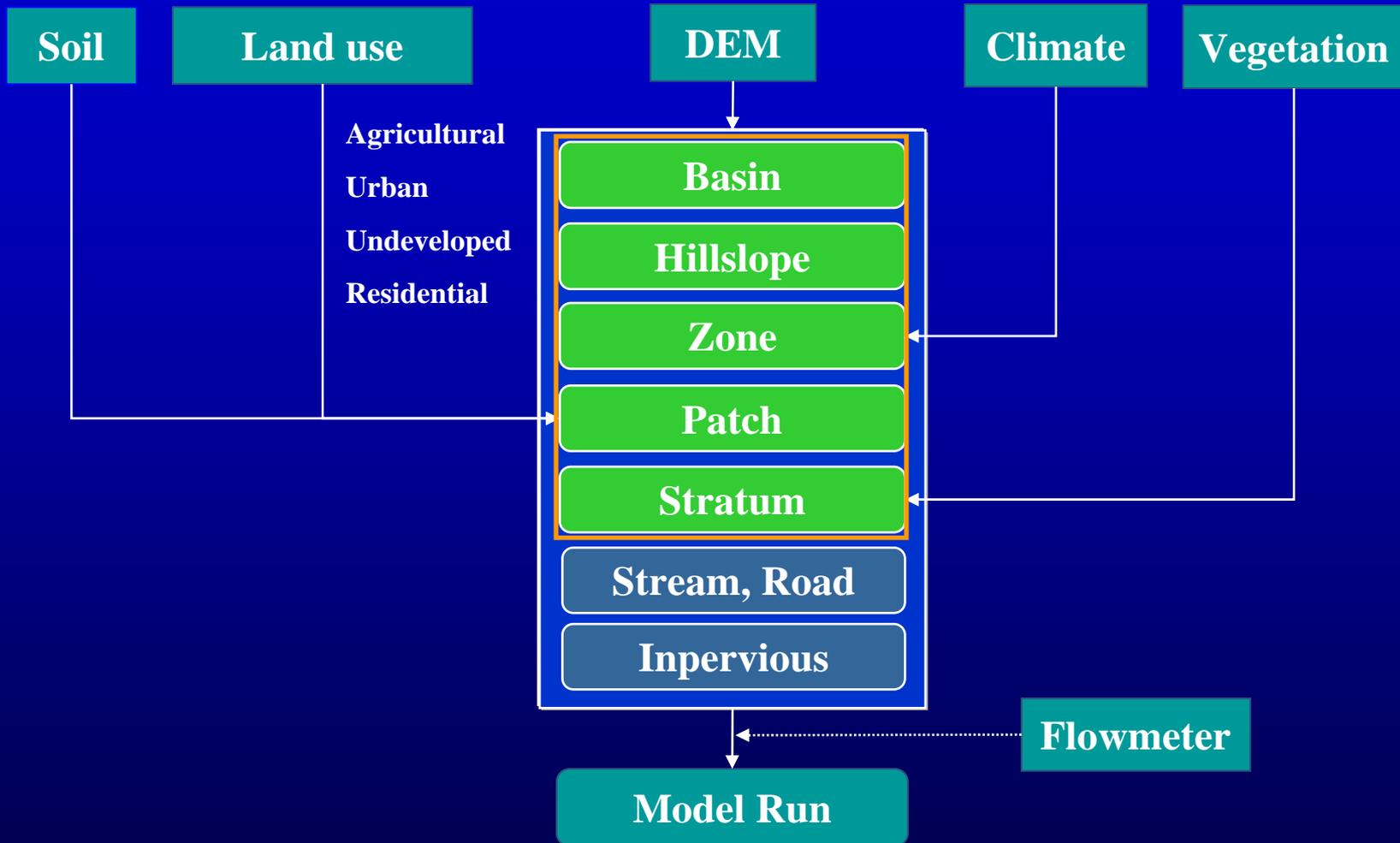


Ecosystem Simulation using Regional Hydrological Ecosystem Simulation System (RHESSys)



Hwang et al. (2009)

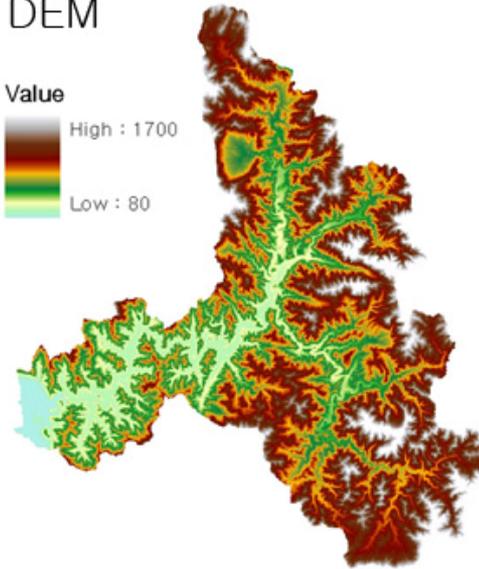
Input Data



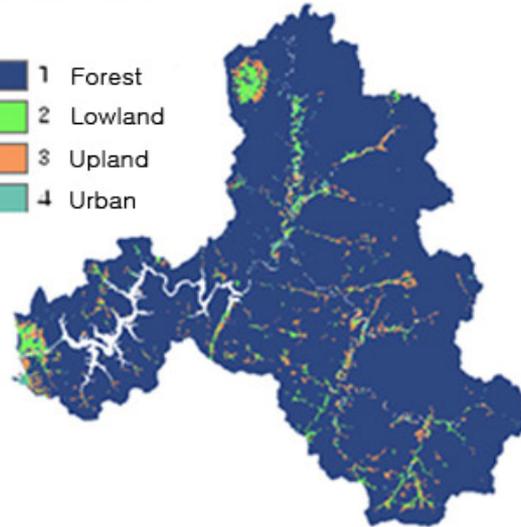
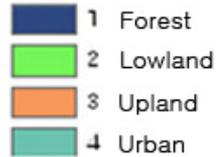
GIS Data for the Soyang Basin

DEM

Value



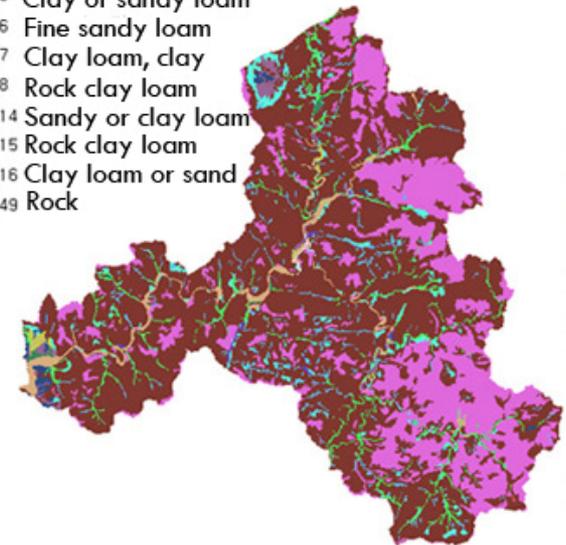
Land use



Legend

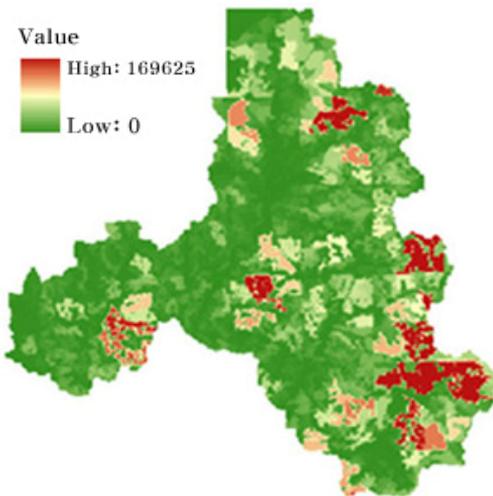
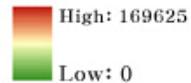


Soil



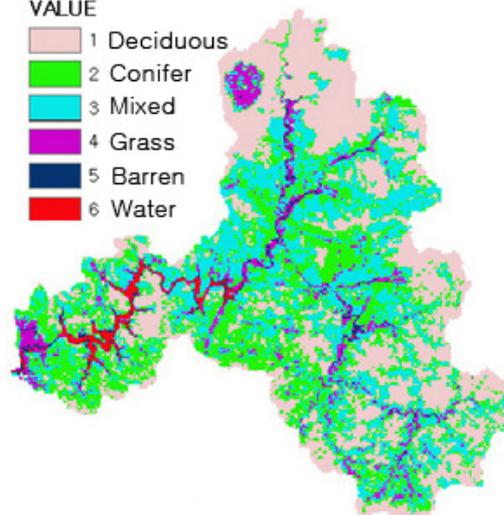
Biomass

Value

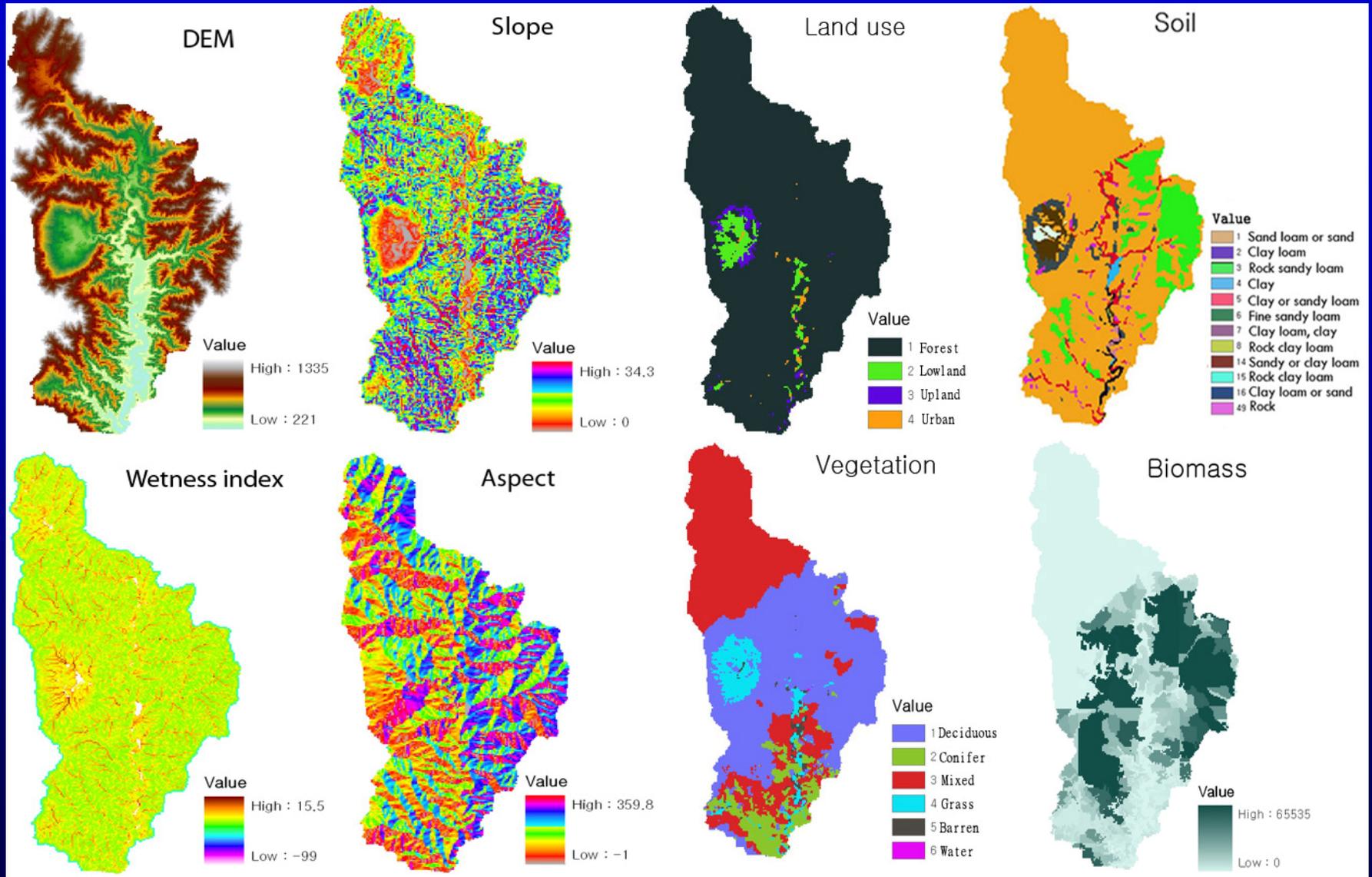


Vegetation

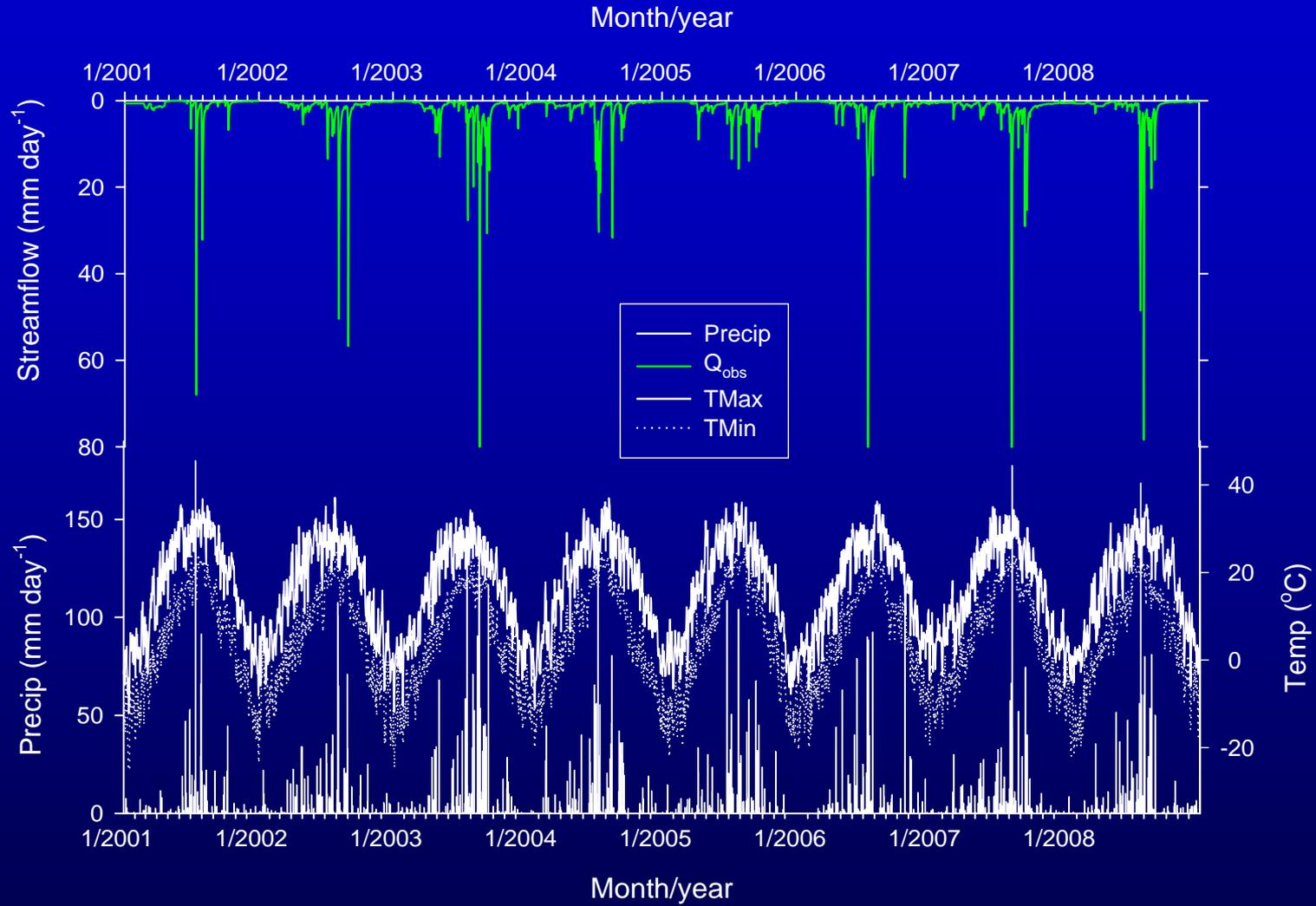
VALUE



GIS Input Data



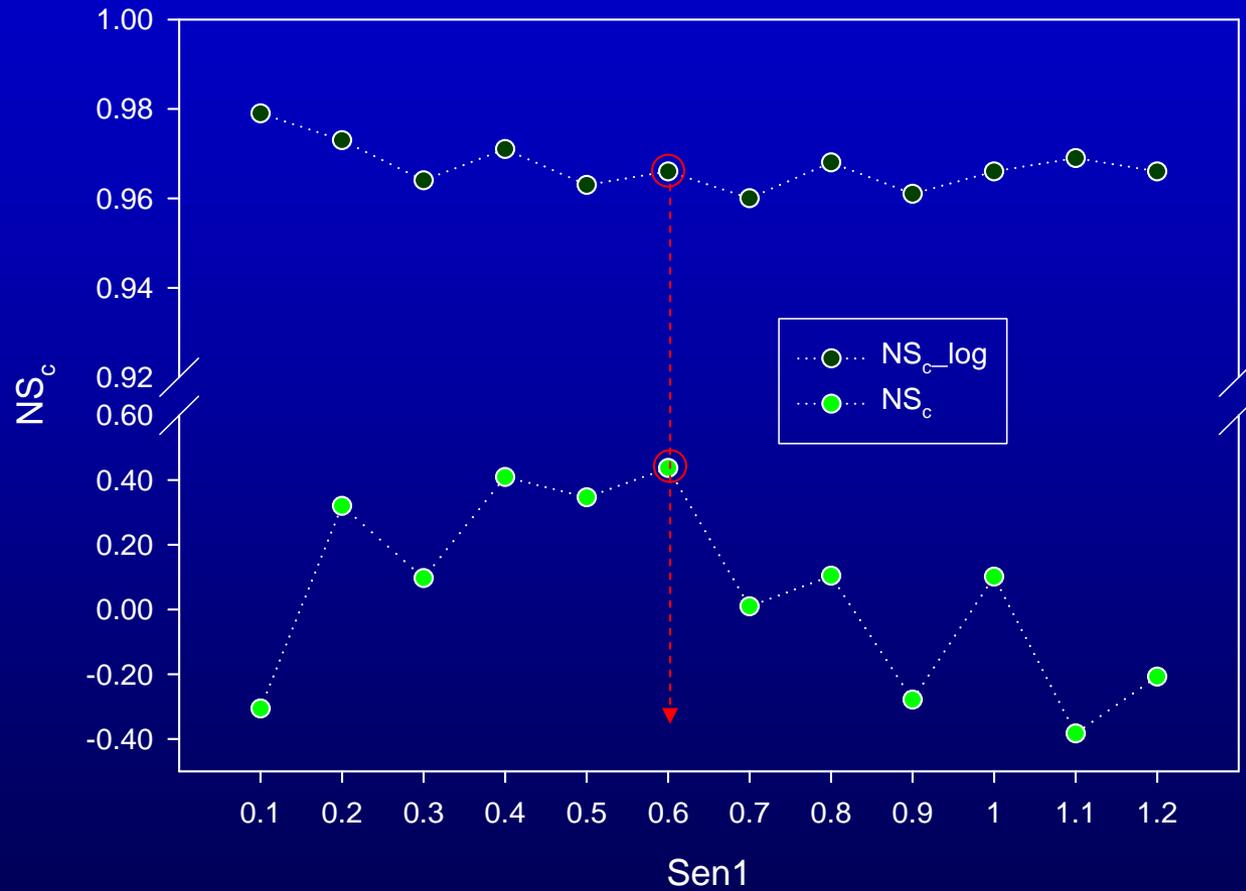
Climate & Streamflow at Inbuk



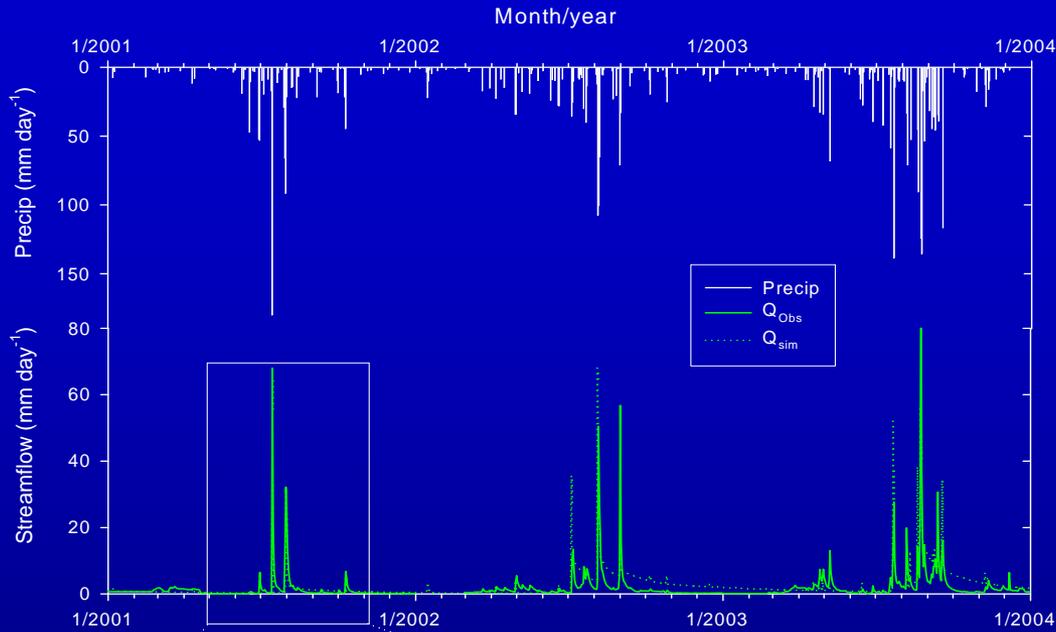
C Ratios for Biomass after Spin-up Runs

Parameter	Description	Deciduous	Conifer
cs_leafc	Leaf carbon	0.000	4.762
cs_dead_leafc	Standing dead leaf carbon	0.000	0.000
cs_leafc_store	Leaf C stored from this years growth	0.000	0.852
cs_live_stemc	Live stem carbon	0.313	0.129
cs_livestemc_store	Live stem C store from this years growth	0.173	0.133
cs_dead_stemc	Dead stem carbon	82.335	70.180
cs_deadstemc_store	Dead stem C stored from this years growth	0.907	1.743
cs_live_crootc	Live coarse root carbon	0.058	0.036
cs_livecrootc_store	Live coarse root C stored from this years growth	0.038	0.039
cs_dead_crootc	Dead coarse root carbon	15.752	19.733
cs_deadcroot_store	Dead coarse root C stored from this years growth	0.200	0.505
cs_frootc	Fine root carbon	0.145	1.597
cs_frootc_store	Fine root C stored from this years growth	0.080	0.289

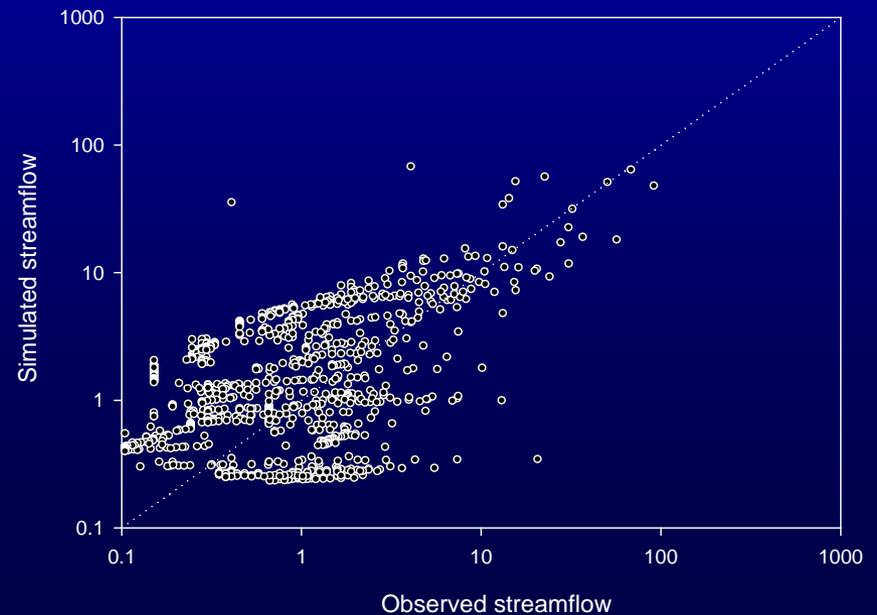
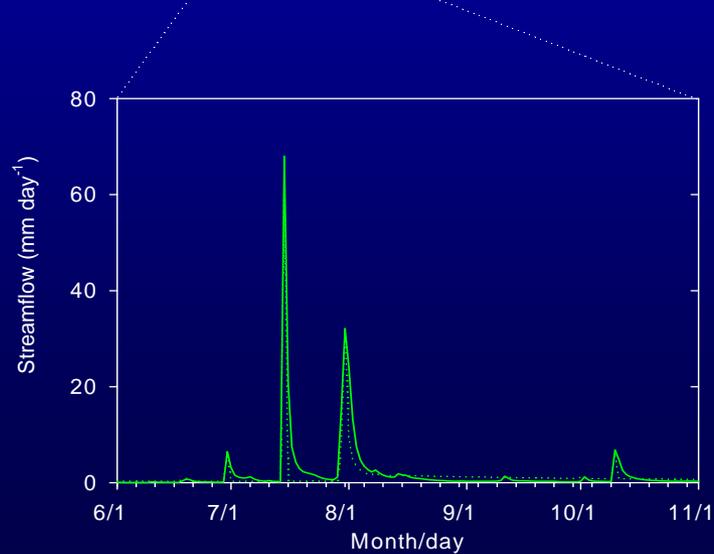
Parameterization



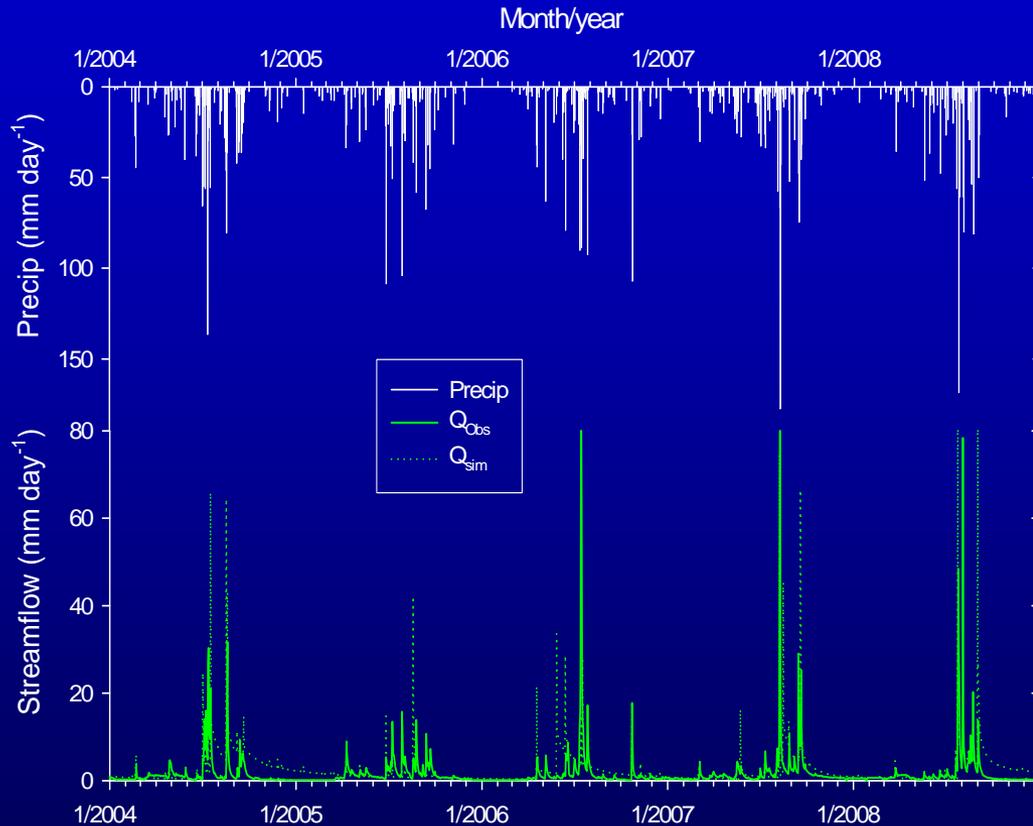
Model Calibration



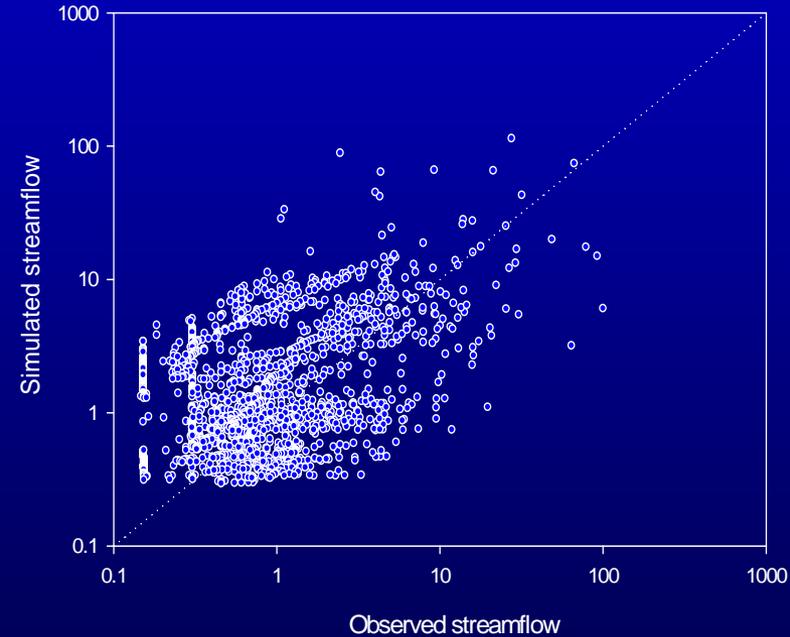
**Simulated vs
measured
streamflow**



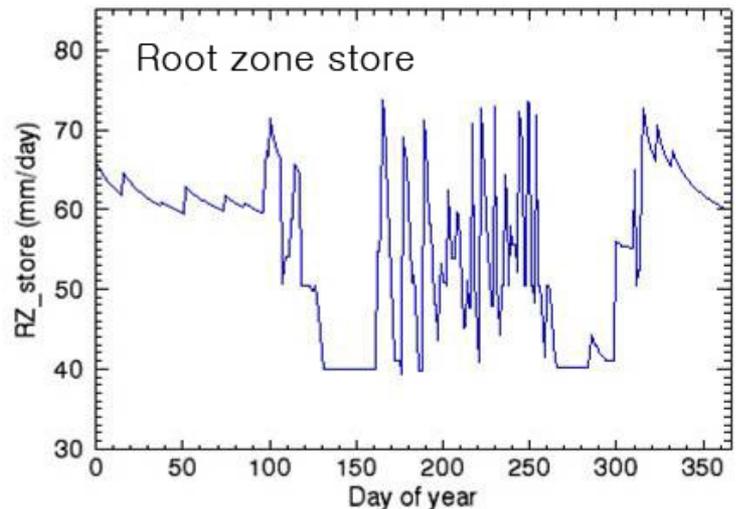
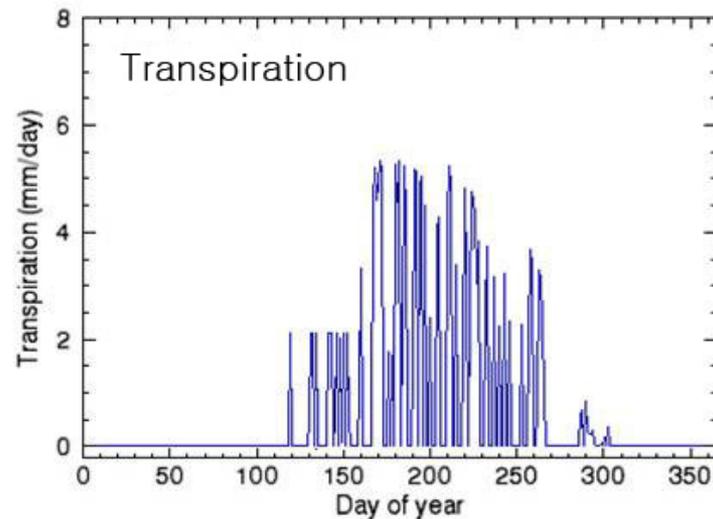
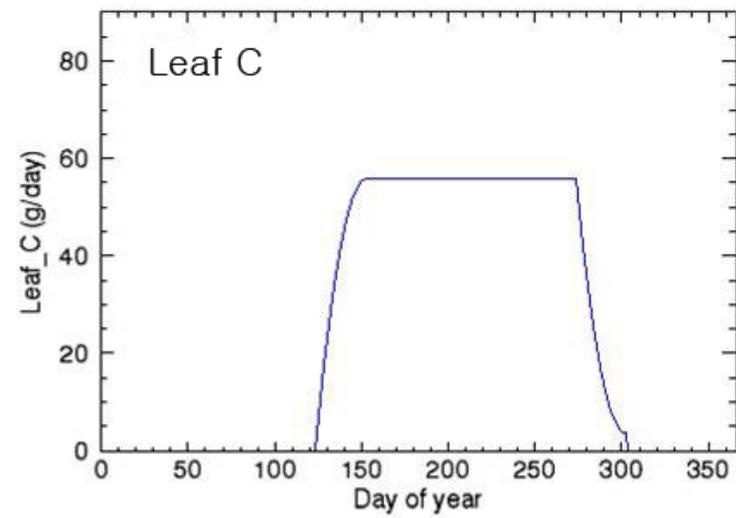
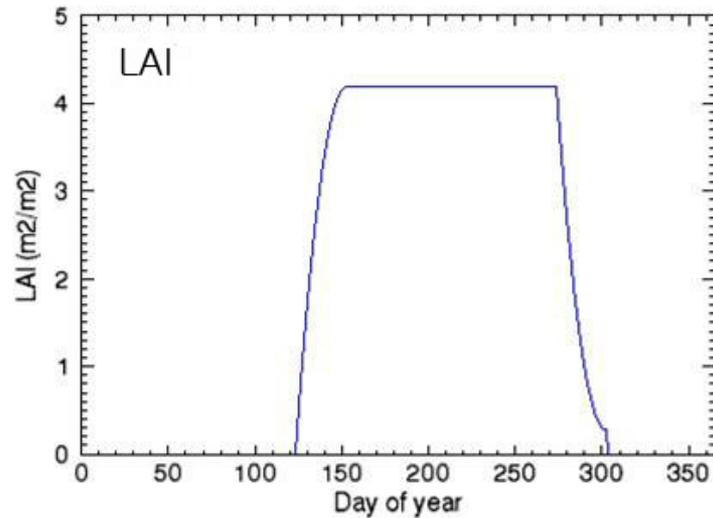
Model Validation



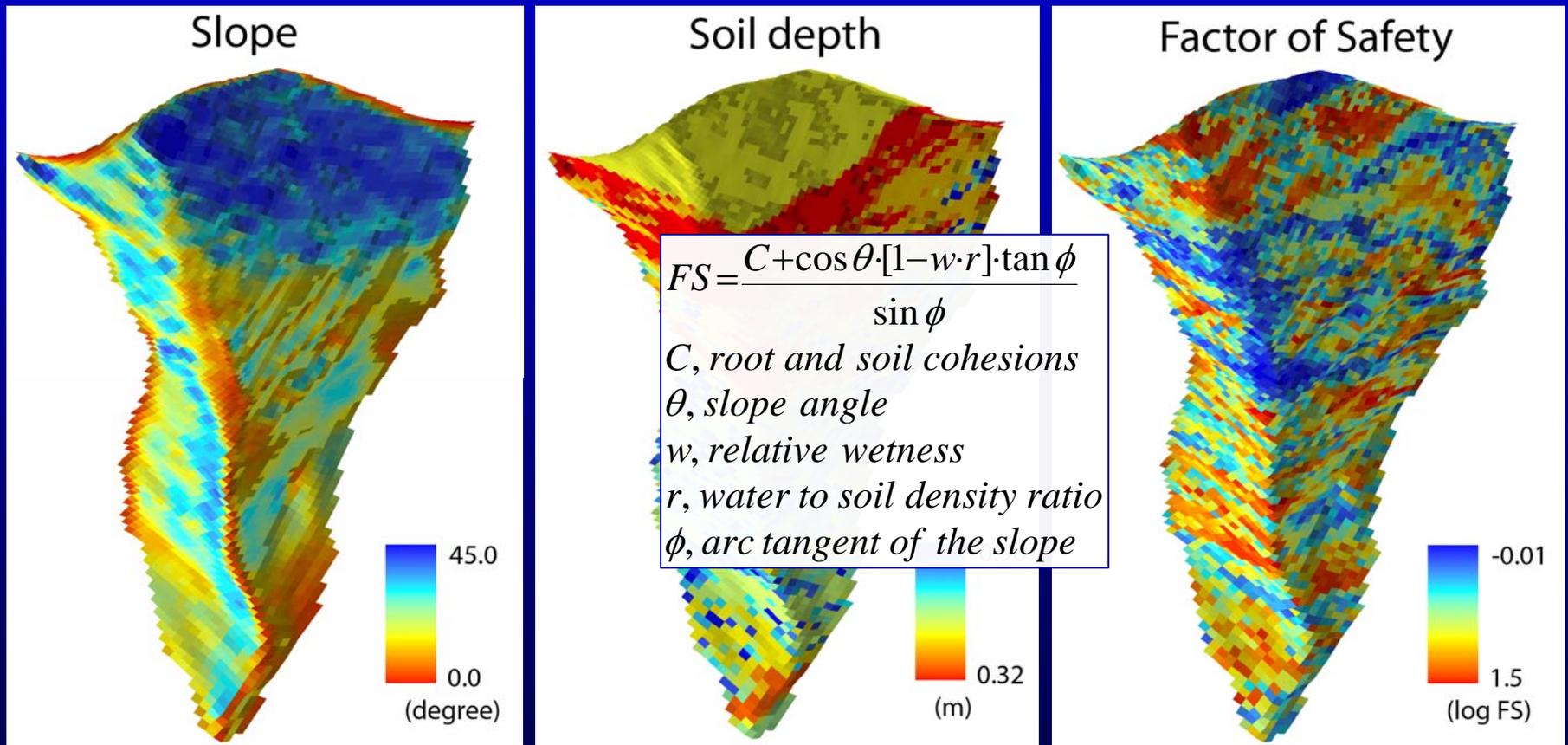
Simulated vs measured streamflow



Seasonal Variations of Simulated Variables



Map Projections of Slope, Soil Depth, and Factor of Safety



Maps produced by Hwang (2010)

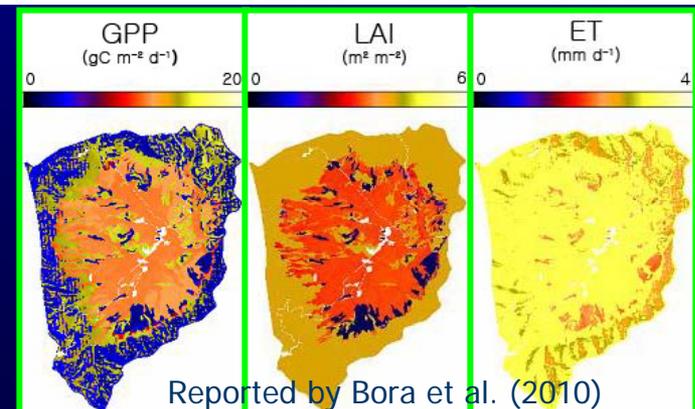
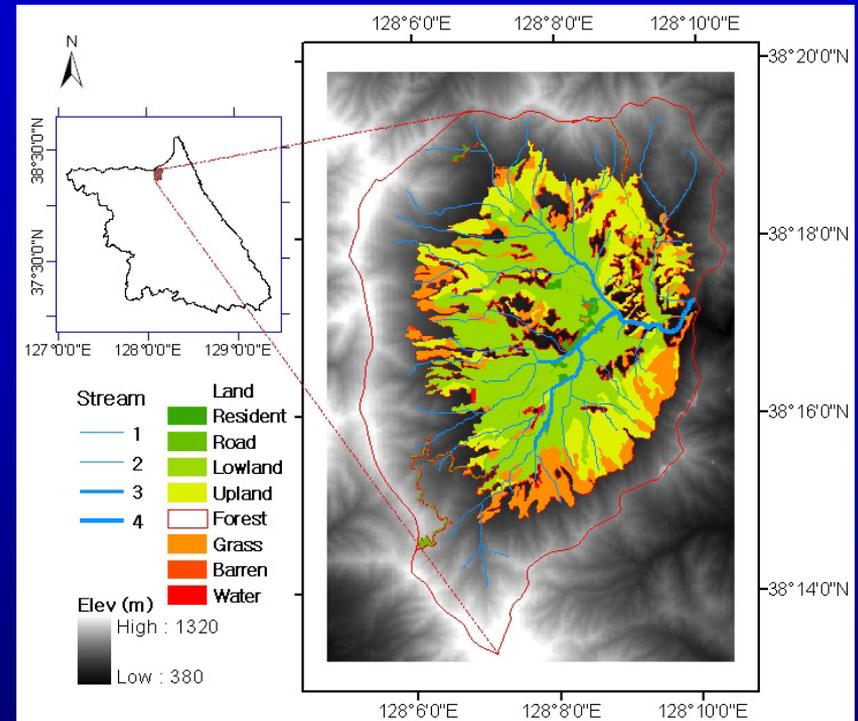
Preliminary Conclusions

- Simulations by the parameterized model show a reasonable agreement with the measurements of streamflow and biomass.
- Results from the validation show a potential to reproduce the variables at a sub-basin scale.

Simulation of Natural Resource Use of a Complex Terrain (Haean Basin)

Examine current and potential future natural resource uses of the Haean basin using RHESSys

- Reproduce the natural resources
- Assess potential climate anomaly/change impacts on the natural resources



Simulation of Climate Change Impacts

Soil moisture deficit
(mm mon⁻¹)

Evapotranspiration
(mm yr⁻¹)

Net Primary Productivity
(gC m⁻² yr⁻¹)

Net Ecosystem Exchange
(gC m⁻² yr⁻¹)

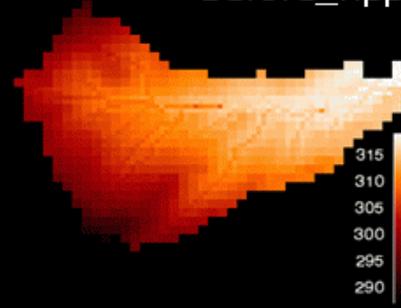
Before_smd

Before_et

Before_npp

Before_nee

Before
30years
(1971~
2000)



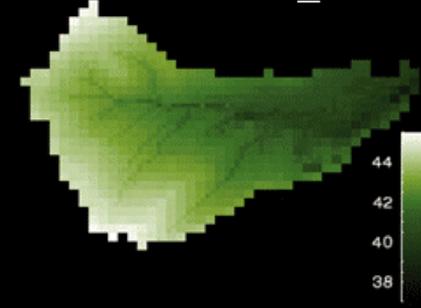
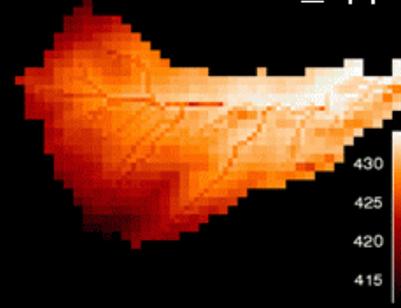
After_smd

After_et

After_npp

After_nee

After
30years
(2071~
2100)



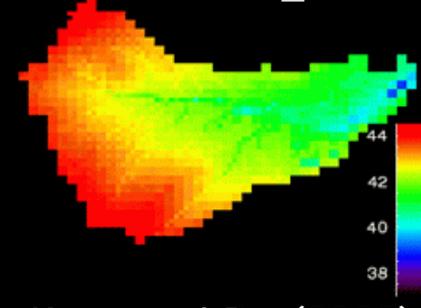
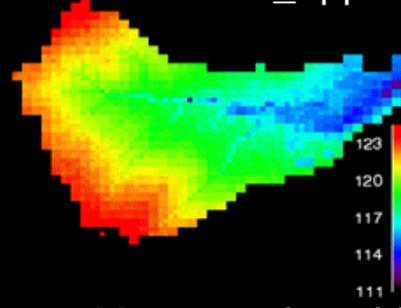
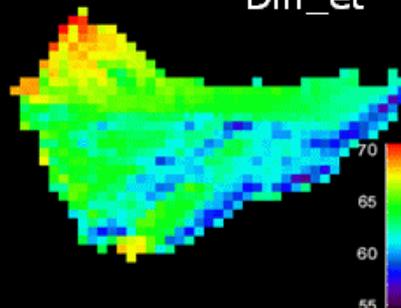
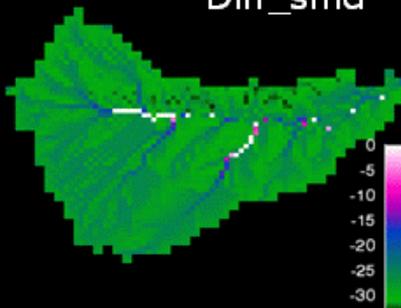
Diff_smd

Diff_et

Diff_npp

Diff_nee

Difference



Maps produced by Kang and Do (2008)

Discussions

- Research scope in ecosystem simulation:
 - Present: current and potential future natural resource uses
 - Suggestion: impacts of climate anomaly or potential climate changes on natural resources
- Research site of the project
 - Present: the Haean terrain
 - Suggestion: mid-basin scales (e.g., Inbuk) in the Soyang basin

Thank you!

