Part III. Scaling up from the farm to catchment and use of nationally available datasets

Exploring a few of the uncertainties of meso and macro scale geospatial data-based models

Background and aim

Simple models linking land based activities with water quantity and quality

Develop data based geospatial catchment scale models

Model development and performance are dependant on the data that are used in their development and operation

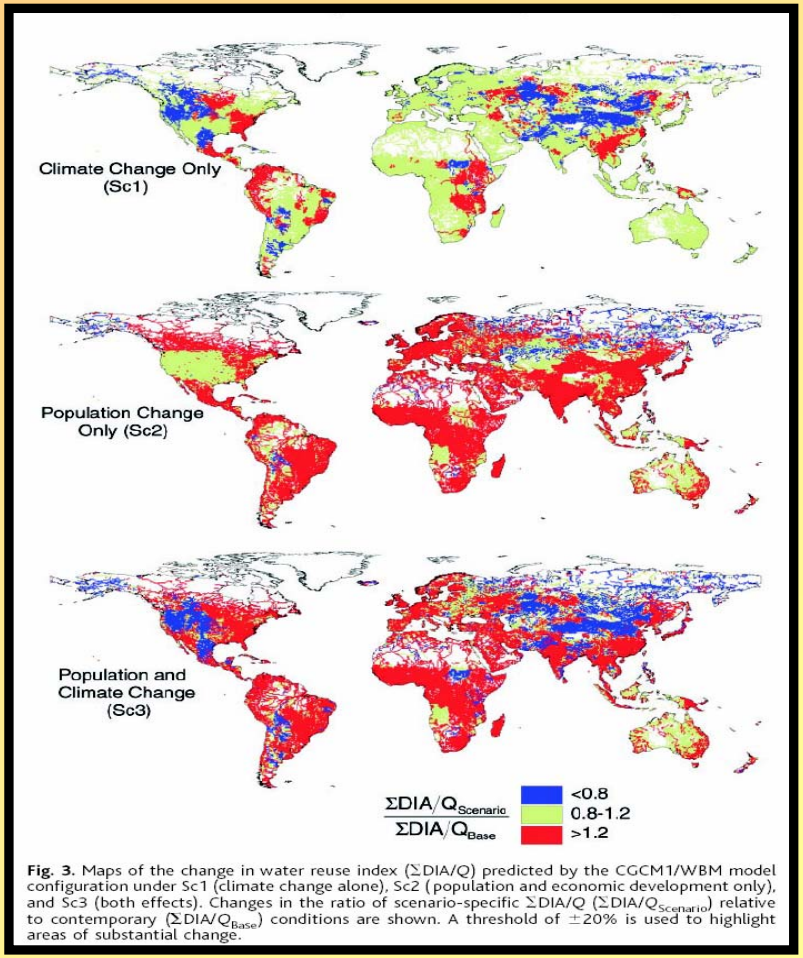


Fig. 3. Maps of the change in water reuse index (ΣDIA/Q) predicted by the CGCM1/WBM model configuration under Sc1 (climate change alone), Sc2 (population and economic development only), and Sc3 (both effects). Changes in the ratio of scenario-specific ΣDIA/Q ($\Sigma DIA/Q_{Scenario}$) relative to contemporary ($\Sigma DIA/Q_{Base}$) conditions are shown. A threshold of ±20% is used to highlight areas of substantial change.

(Vörösmarty *et al*., 2000)

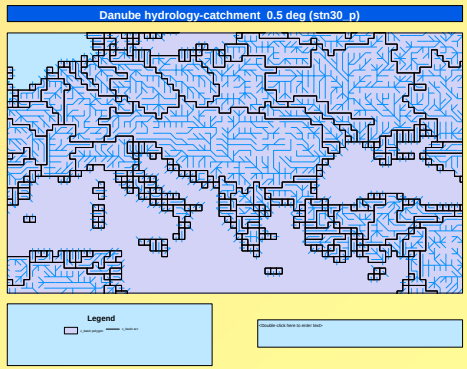
Uncertainties of meso and macro scale geospatial models

Data sets

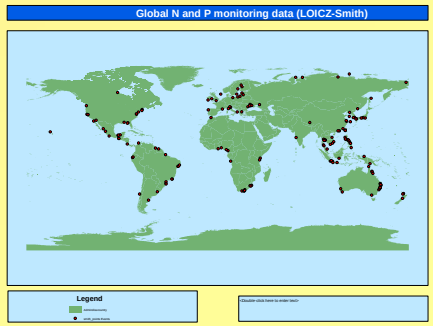
-geospatial catchment descriptors

-catchment outlines

Focus

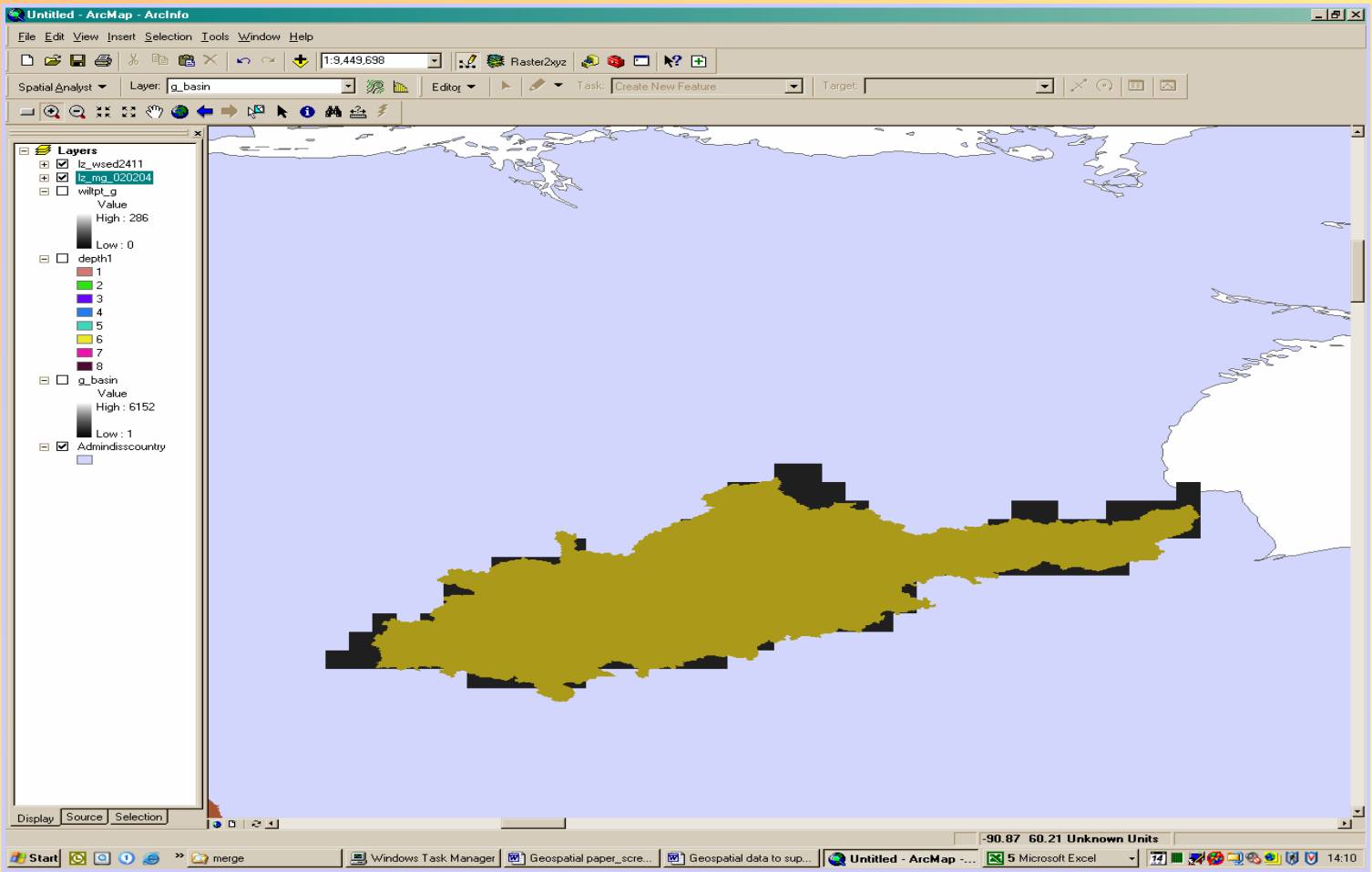


-observations



How do you define your catchment?

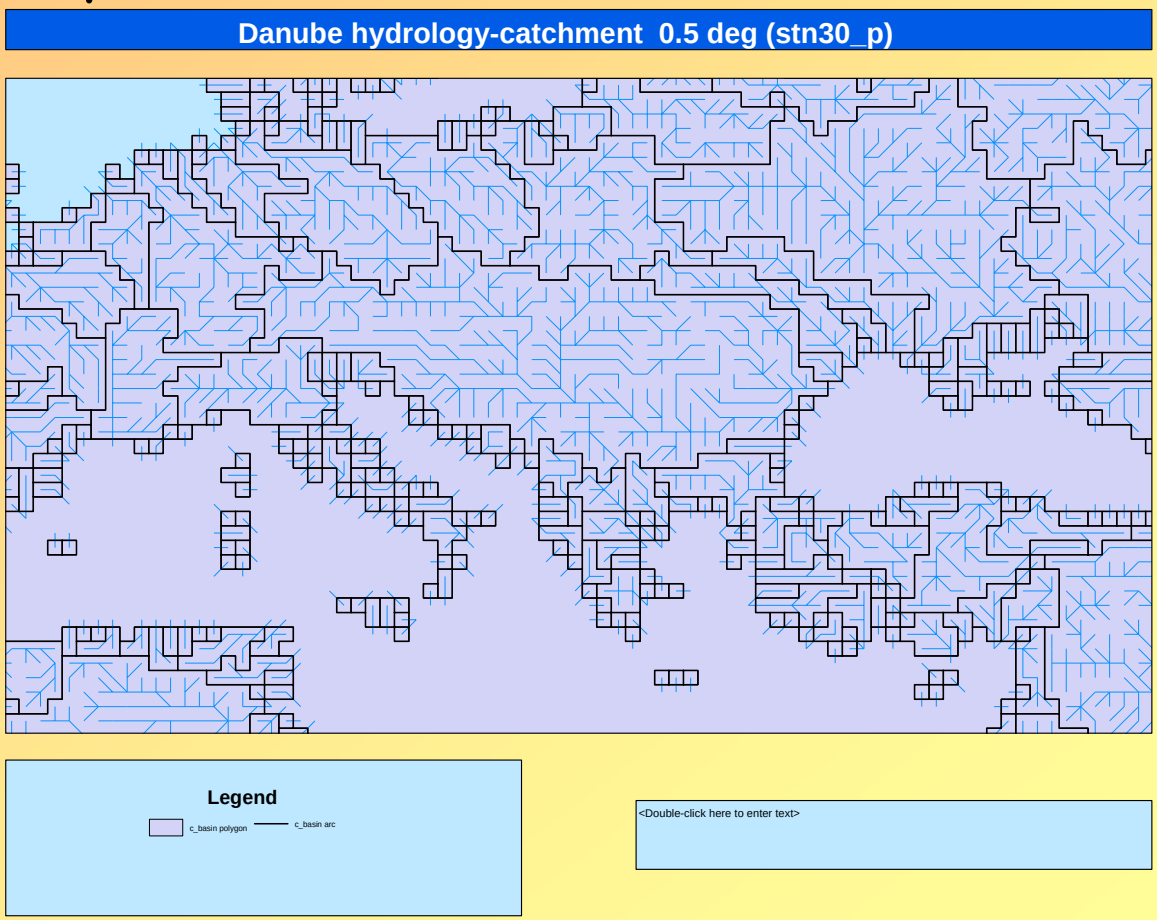
Method *f* (perceptual model, extent, resolution)



Which representation of your catchment to use?

STN30P
Vörösmarty *et al.*, 2000

TRIP
Oki and Sud 1998



Kappa statistics

$$kappa = \frac{(Po - Pc)}{(Pp - Pc)}$$

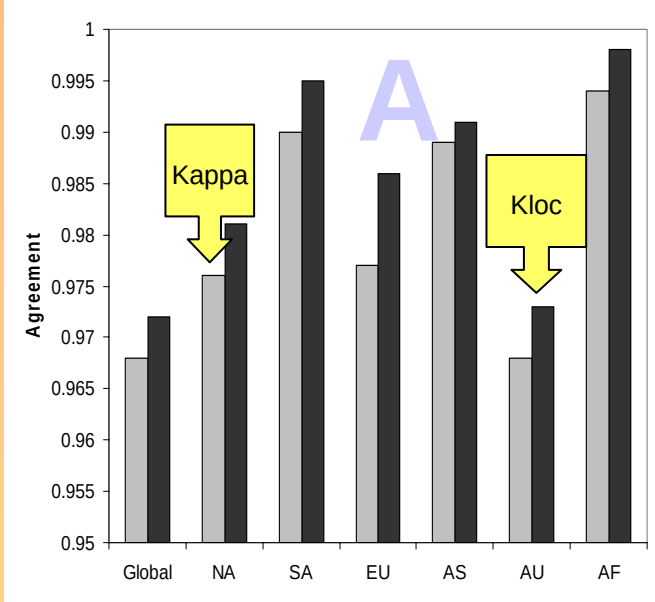
Crisp Kappa

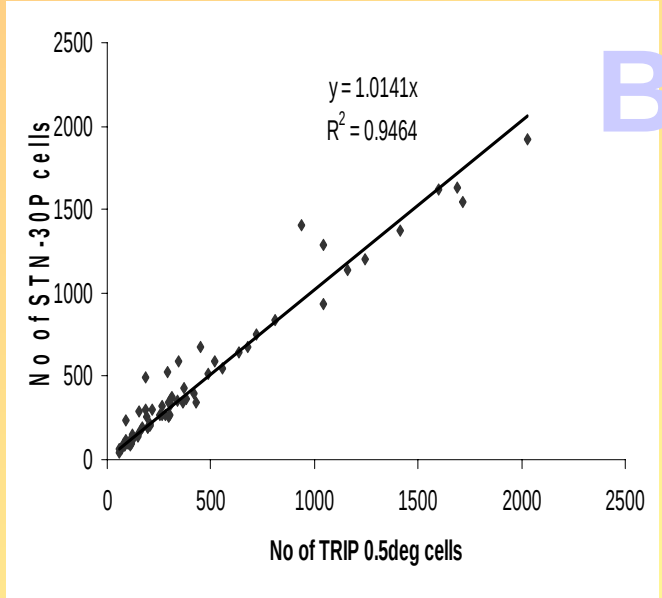
Kappa, Klocation (Pontius 2000), Khisto (Hagen 2002)

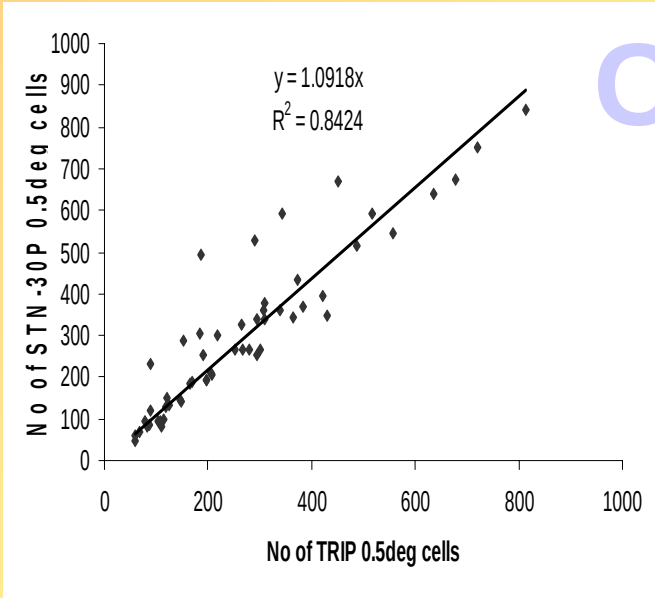
Fuzzy Kappa

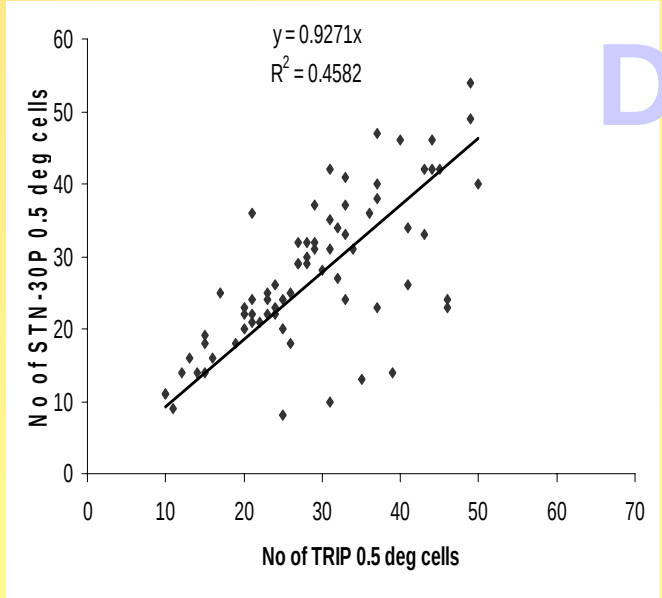
Kfuzzy (Hagen 2003), Global fuzzy kappa (Power *et al.*, 2001)

Comparison of two global 0.5 deg river networks

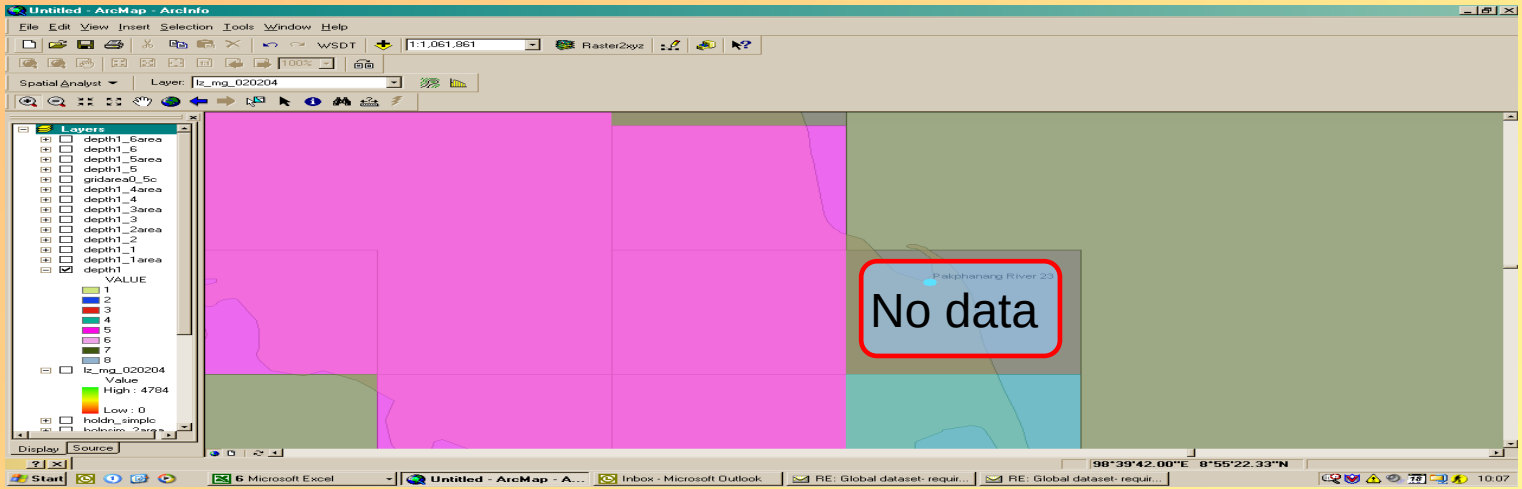


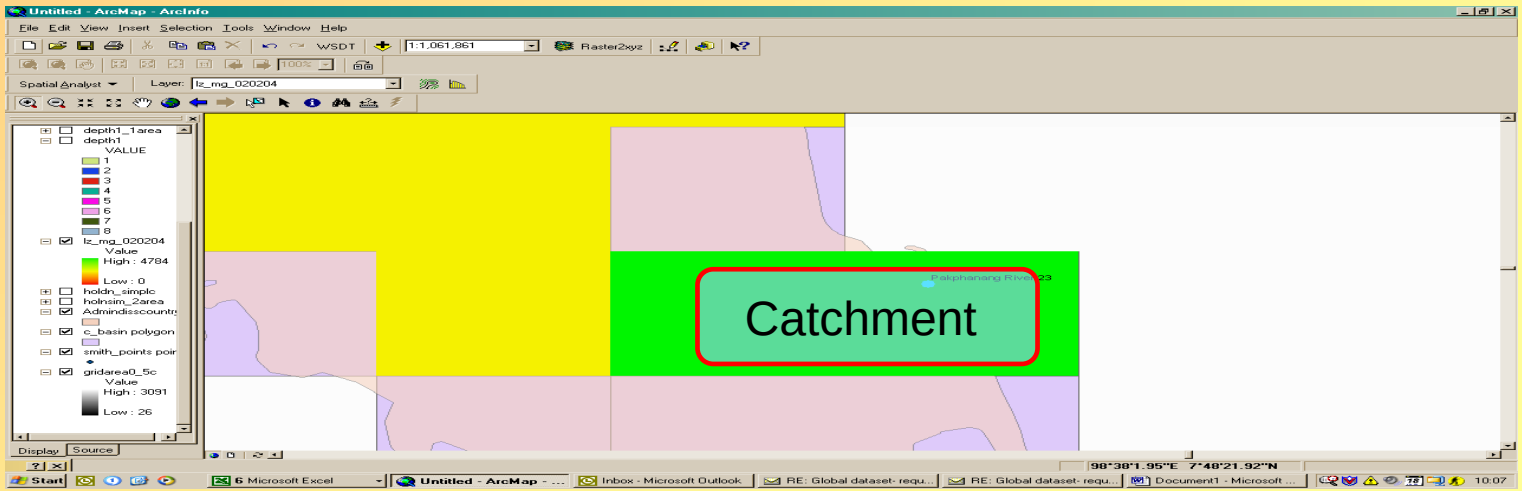


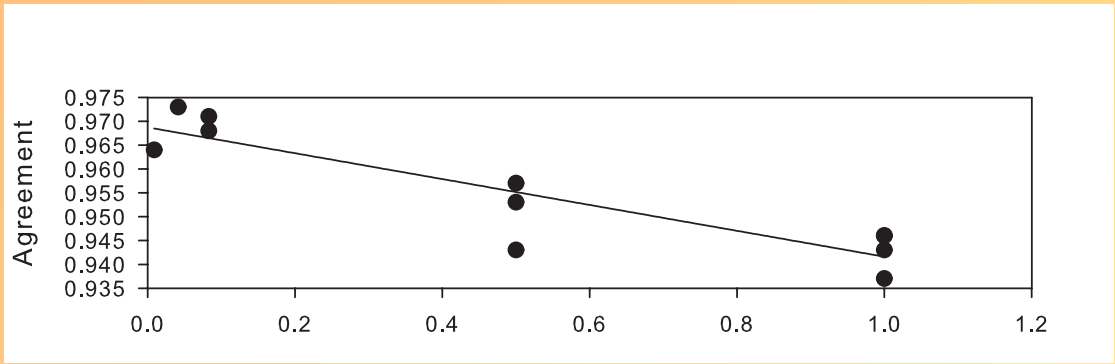




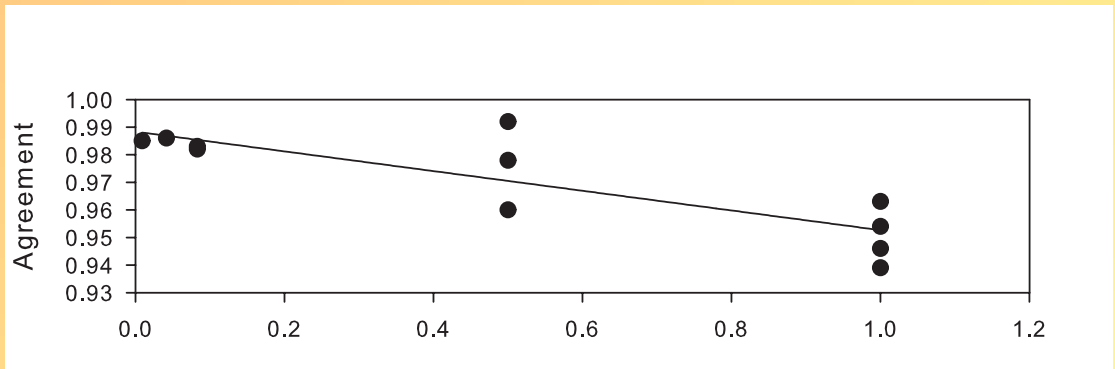
Agreement between catchment descriptors and catchment outlines



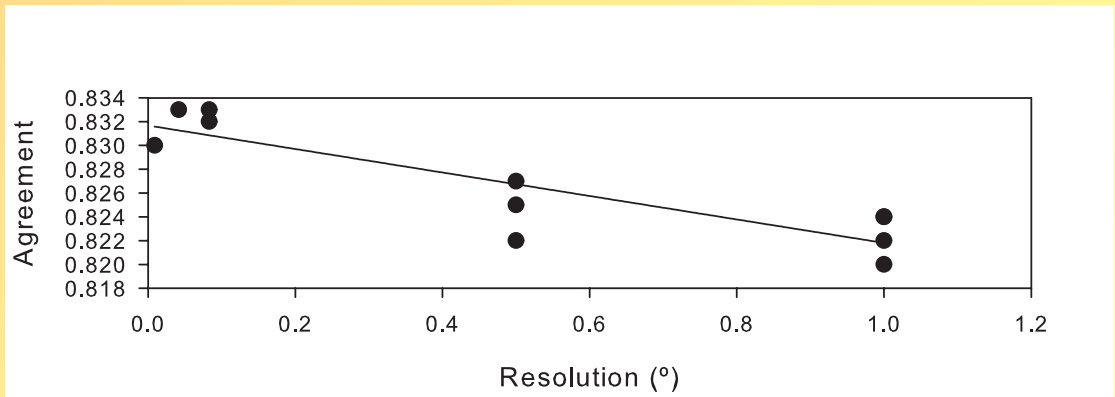




Kappa

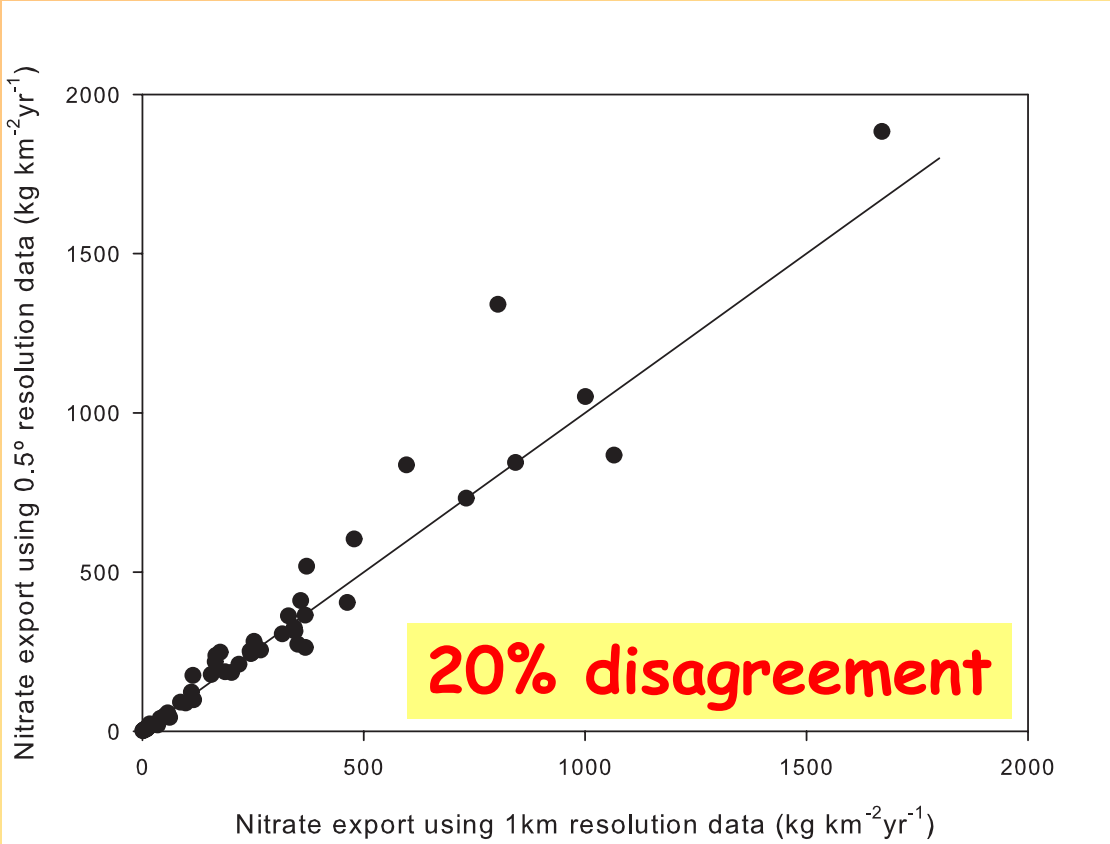


Klocation



Global fuzzy kappa

Influence of catchment outline on model results



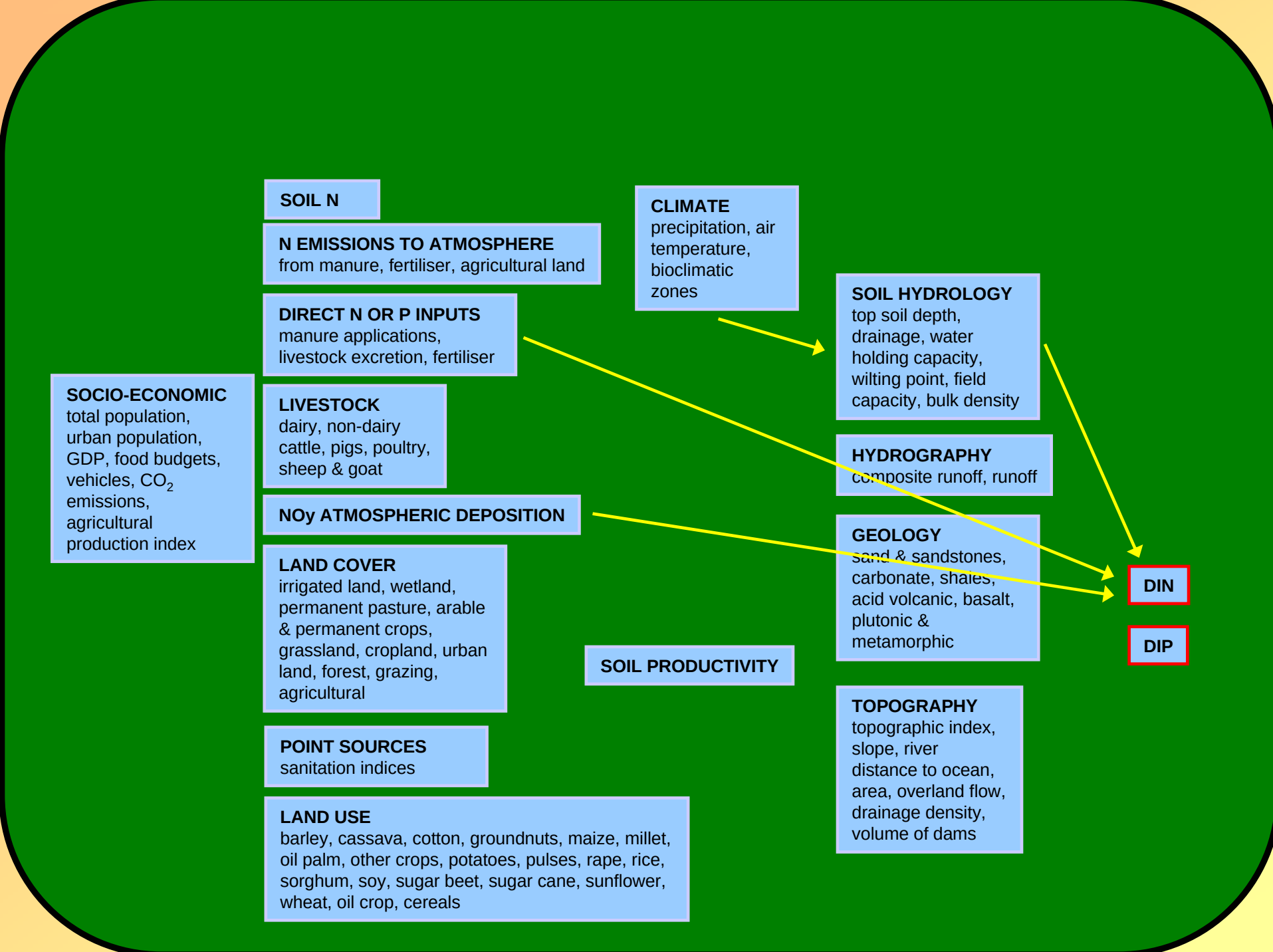
Caraco and Cole, 1999

DIN *f*(urban pop, runoff, N fert, N dep)

How can comparison statistics support moving to the catchment scale?

Wealands *et al.*, 2005

	SPATIAL DATA TYPE
1. INPUTS	
Raw observations	BOTH
Hydrological model simulations/predictions	BOTH
Surrogate observations	BOTH
2. PRE-PROCESSING	
Condition (e.g. noise reduction)	BOTH
Interpolate (points to spatial field)	CONTINUOUS
Resample (to required resolution)	BOTH
Categorise (convert spatial field from continuous to categorical)	BOTH
Segment (convert spatial field from continuous to categorical)	CONTINUOUS
Identify important features	BOTH
3. PROCESSED INPUTS (these can be multiscale inputs)	
Observed spatial field(s)	BOTH
Predicted spatial field(s)	BOTH
4. COMPARISON METHODS	
Feature-by-feature comparison	BOTH
Weighted feature-by-feature comparison	BOTH
Fuzzy comparison	CATEGORICAL
5. INTERMEDIATE MEASURES	
Scatterplot	N/A
Residuals map	CONTINUOUS
Confusion matrix	N/A
Fuzzy map	CONTINUOUS
6. COMPARISON MEASURES (these can vary with scale)	
Correlation coefficient	N/A
Kappa statistic (including fuzzy kappa)	N/A
Mean squared error (MSE) or weighted MSE	N/A
% accuracy	N/A
Comparison metric	N/A


SOIL N
N EMISSIONS TO ATMOSPHERE
from manure, fertiliser, agricultural land
DIRECT N OR P INPUTS
manure applications, livestock excretion, fertiliser
SOCIO-ECONOMIC
total population, urban population, GDP, food budgets, vehicles, CO_2 emissions, agricultural production index
LIVESTOCK
dairy, non-dairy cattle, pigs, poultry, sheep & goat
NOy ATMOSPHERIC DEPOSITION
LAND COVER
irrigated land, wetland, permanent pasture, arable & permanent crops, grassland, cropland, urban land, forest, grazing, agricultural
POINT SOURCES
sanitation indices
LAND USE
barley, cassava, cotton, groundnuts, maize, millet, oil palm, other crops, potatoes, pulses, rape, rice, sorghum, soy, sugar beet, sugar cane, sunflower, wheat, oil crop, cereals
CLIMATE
precipitation, air temperature, bioclimatic zones
SOIL HYDROLOGY
top soil depth, drainage, water holding capacity, wilting point, field capacity, bulk density
HYDROGRAPHY
composite runoff, runoff
GEOLOGY
sand & sandstones, carbonate, shales, acid volcanic, basalt, plutonic & metamorphic
SOIL PRODUCTIVITY
TOPOGRAPHY
topographic index, slope, river distance to ocean, area, overland flow, drainage density, volume of dams
DIN
DIP