

HYACINT – Afsluttende seminar 20. marts 2013

Hydrologisk modellering af North China Plain



ALECTIA

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FOLKEKONGRESSEN

Hvad er folkekongressen?

Folkekongressen er Kinas lovgivende forsamling. Den består af næsten **3000** delegerede fra alle vegne af Kina. Folkekongressen samles én gang om året i to uger for at godkende lovforslag.

Topchefer fra kinesisk erhvervsliv, politiske ledere og tibetanske munke samt nogle af Kinas rigeste forretningsfolk deltager i kongressen.

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Hvordan foregår det?

Afgående premierminister Wen Jiabao afleverer sin rapport om unionens tilstand. Han ventes at tale om emner som **korruption, miljøproblemer** og **økonomisk ulighed**.

Folkekongressen godkender Kinas regering og **Li Keqiang** vælges som ny premierminister.



På kongressens sidste dag vælges **Xi Jinping** formelt som Kinas nye præsident.



Kina: Folkekongressen slutter med protest

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Kinas Folkekongres har nu afsluttet sin årlige samling. Den forløb som sædvanlig i god ro og orden, men på et enkelt punkt var det umuligt at styre forsamlingen til sidst.



Smog over Beijing. Den alvorlige forurening i Kina endte med at tema på dette års folkekongres. Foto: EPA/ADRIAN BRADSHAW

North China Plain (NCP)

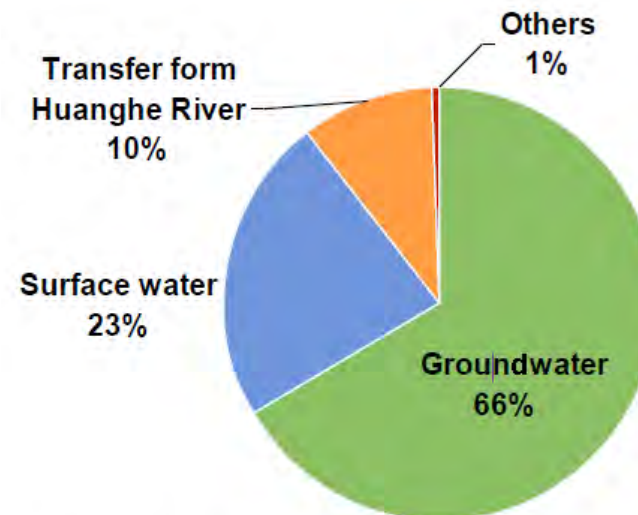
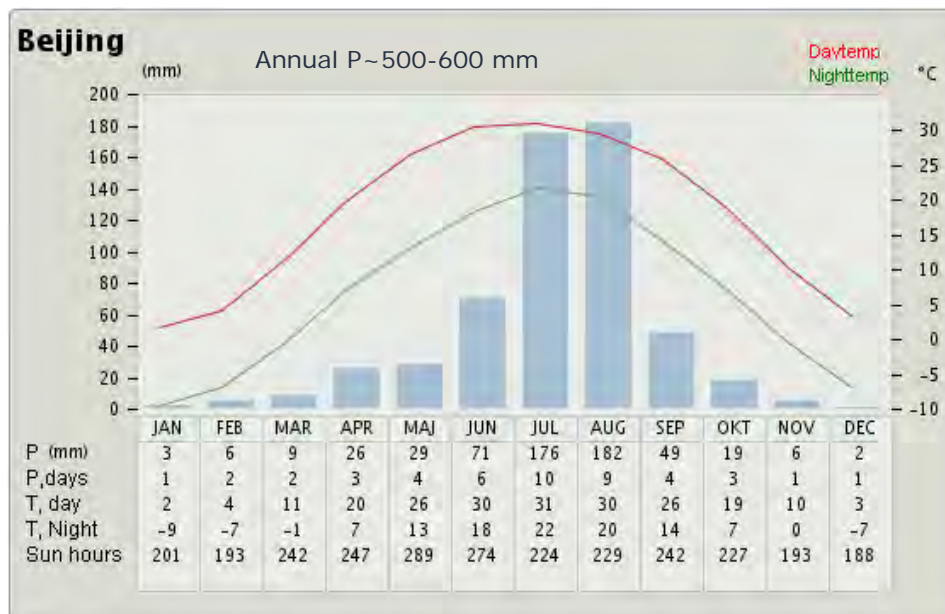


Hvordan havnede vi i NCP?

- International anvendelse af metoder
- Yunqiao **Shu**, 2010, Dept. of Geography and Geology, University of Copenhagen
 - “Integrated remote sensing and hydrological modeling for groundwater resources assessment and sustainable use in the North China Plain”
- Guoliang **Cao**, 2011, Dept. of Geological Sciences, University of Alabama
 - “Recharge estimation and sustainability assessment of groundwater resources in the North China Plain”

Vigtige hydrologiske elementer?

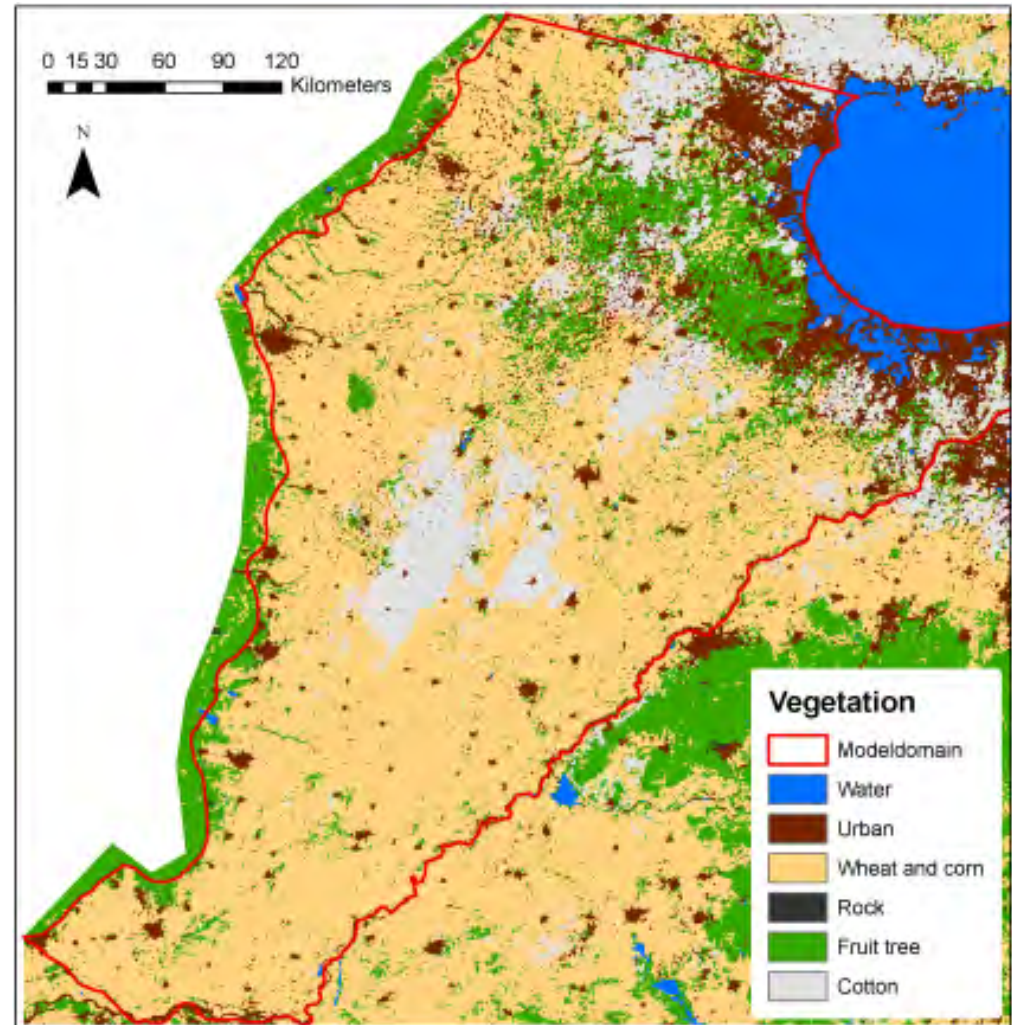
- Klima domineret af monsun sæson
- Grundvand er den primære ressource i NCP
- Begrænset eller sæson



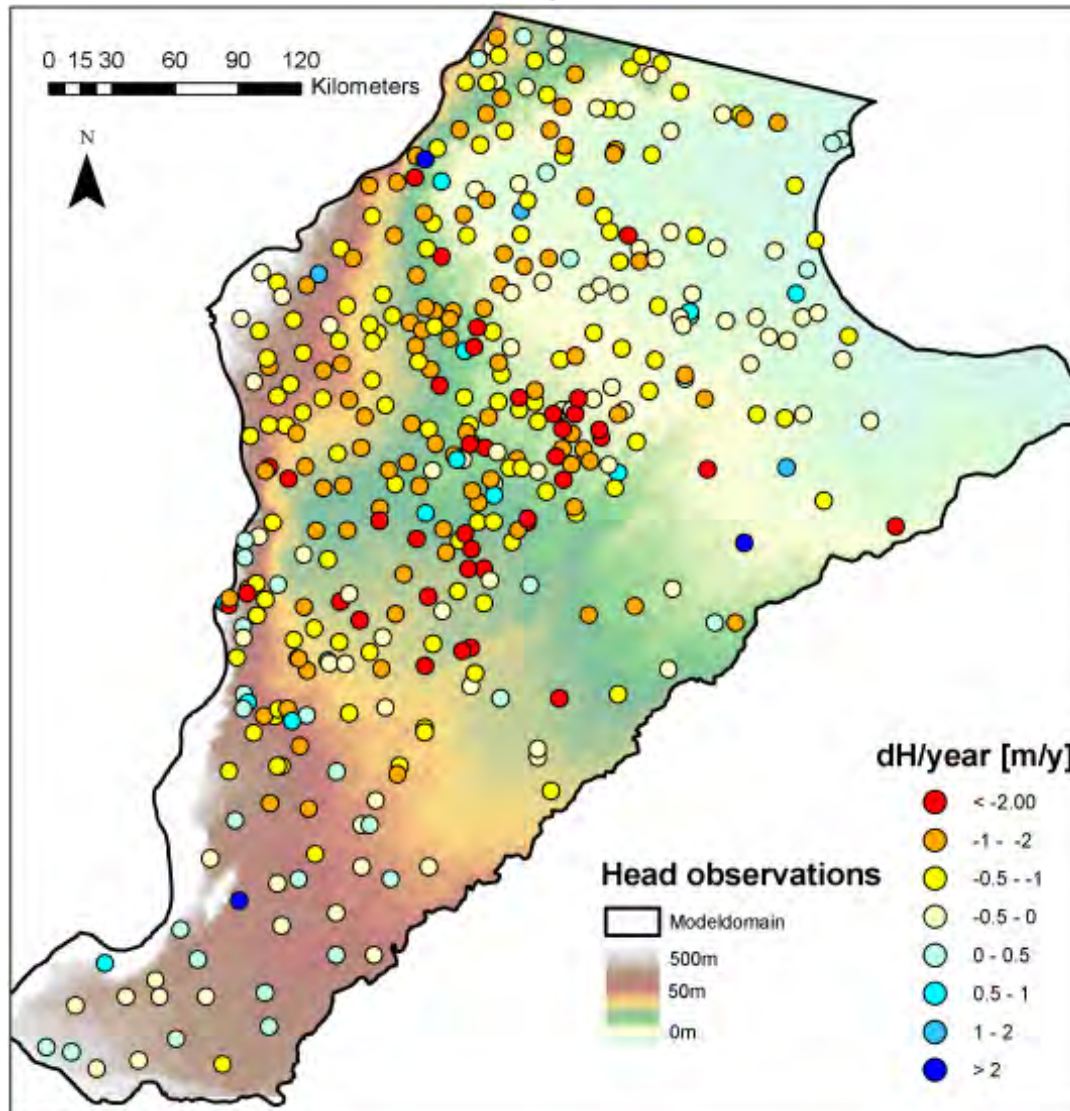
Water supply from different sources for the NCP in 2000

Arealanvendelse

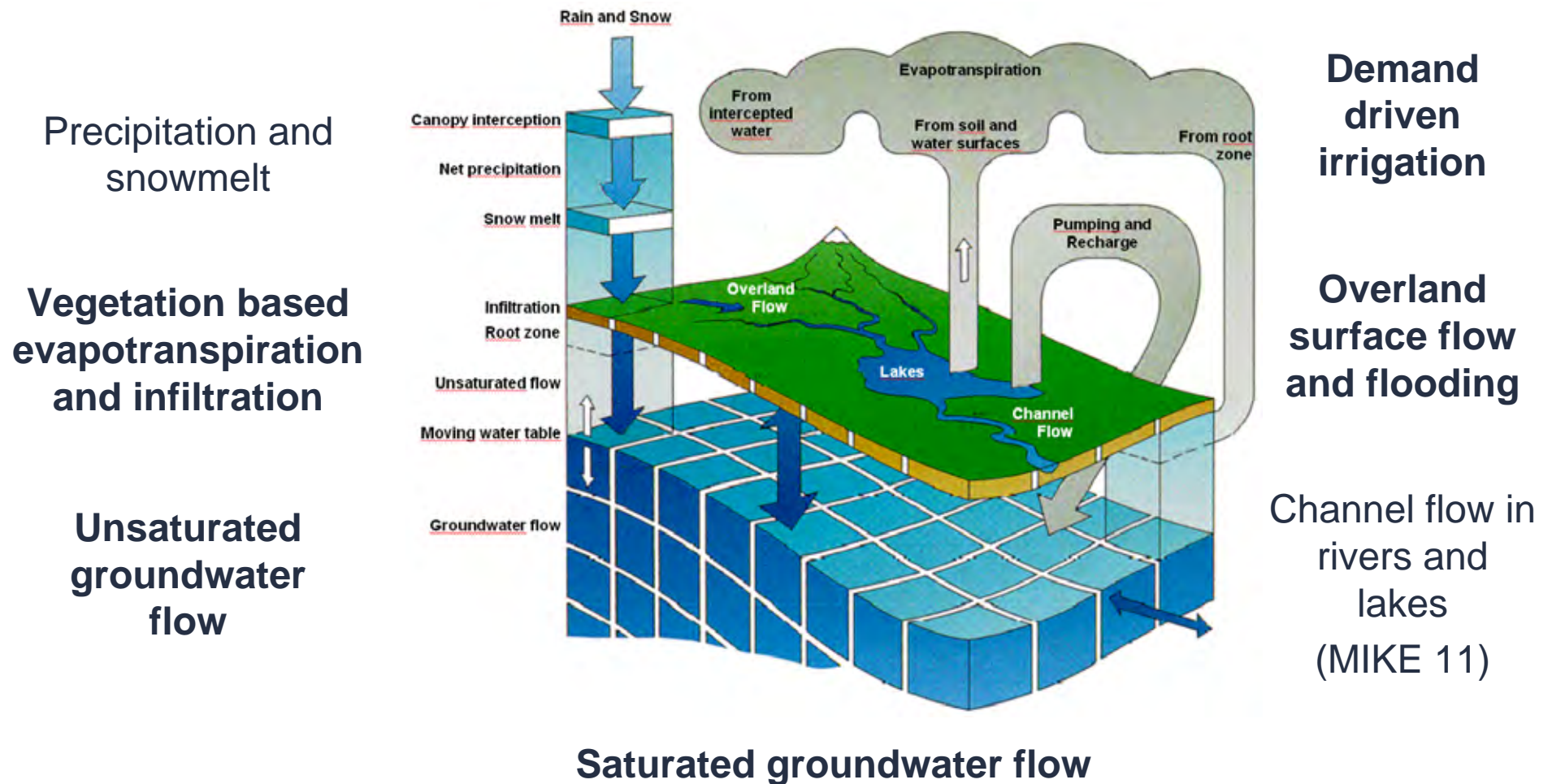
- > 80 % er dyrket
 - Hvede og Majs
 - Bomuld
 - Frugttræer
- > 50 % er vandet
- Vanding foregår primært med grundvand



Grundvandssænkning



MIKE SHE – mulighed for integrering af klimadata



Precipitation and snowmelt

Vegetation based evapotranspiration and infiltration

Unsaturated groundwater flow

Saturated groundwater flow

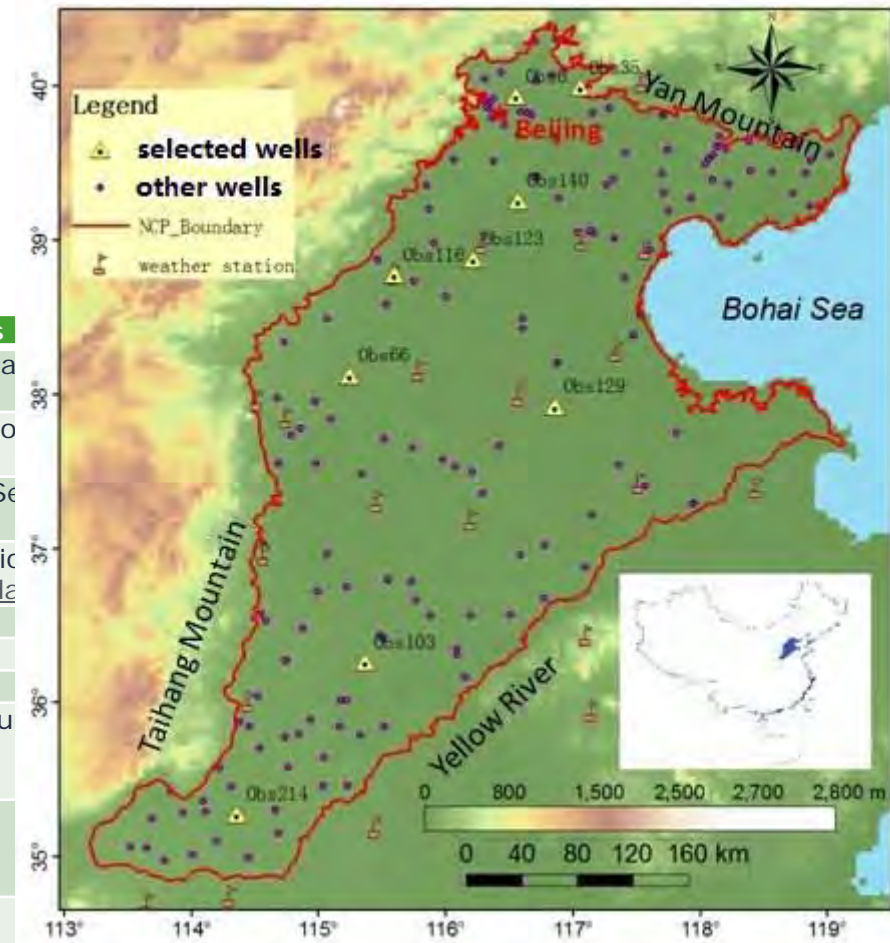
Demand driven irrigation

Overland surface flow and flooding

Channel flow in rivers and lakes (MIKE 11)

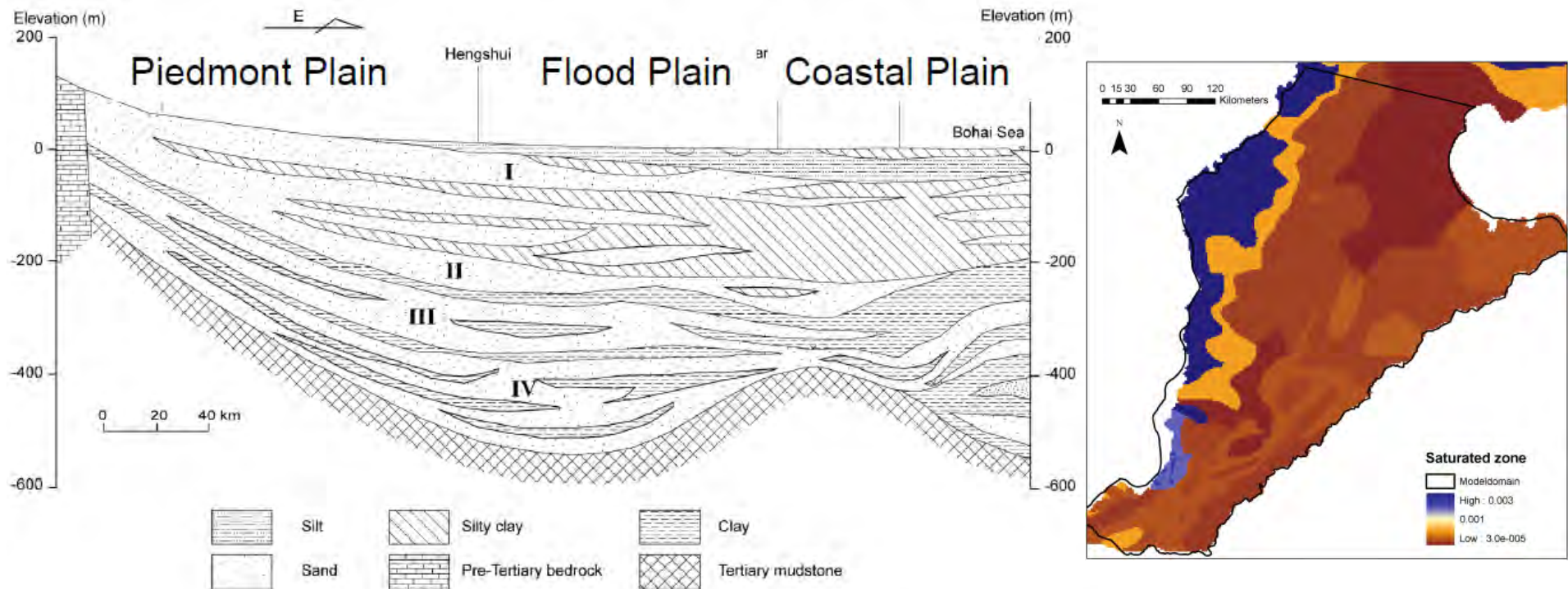
Kombineret model

Data name	Data type	Data sources
Topography	Distributed map	SRTM 90m Digital Elevation Data (http://srtm.csi.cgiar.org)
Precipitation	Distributed map	TRMM 10km Digital Precipitation (http://trmm.gsfc.nasa.gov)
Reference ET	Distributed map	Chinese Meteorological Data Set
Vegetation	Distributed map	MODIS NDVI based classification (http://modis.gsfc.nasa.gov/data)
Leaf Area Index	Time series	Measured or from literature
Crop coefficient	Time series	Measured or from literature
Root depth	Time series	Measured or from literature
River network and cross sections	—	China Institute of Water Resources Hydropower Research (IWHR)
River water levels and discharges	Time series	IWHR
Soil type	Distributed map	Soil map of Hebei province
Bottom elevation of each layer of the aquifer system	Distributed map	Geological map of North China Plain Geological Survey of China (http://xacgs.net)
Geological units	Distributed map	Cao et al., 2012
Observed wells	Time series	Cao et al., 2012
Pumping wells	Time series	Qin et al., 2012
Irrigation	Map	Shu et al., 2010



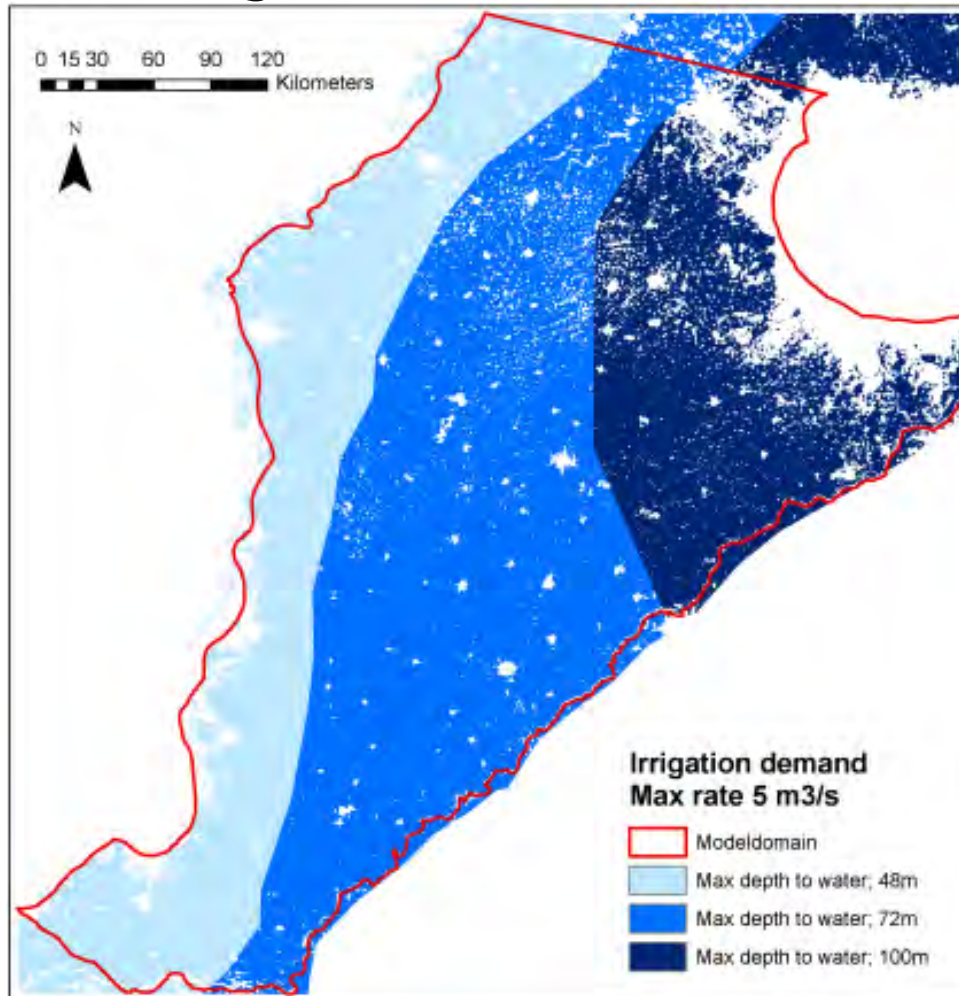
Hydrogeologi

- Quaternary aquifer
 - Shallow sand and gravel (I and II)
 - Deep medium/fine sand (III and IV)



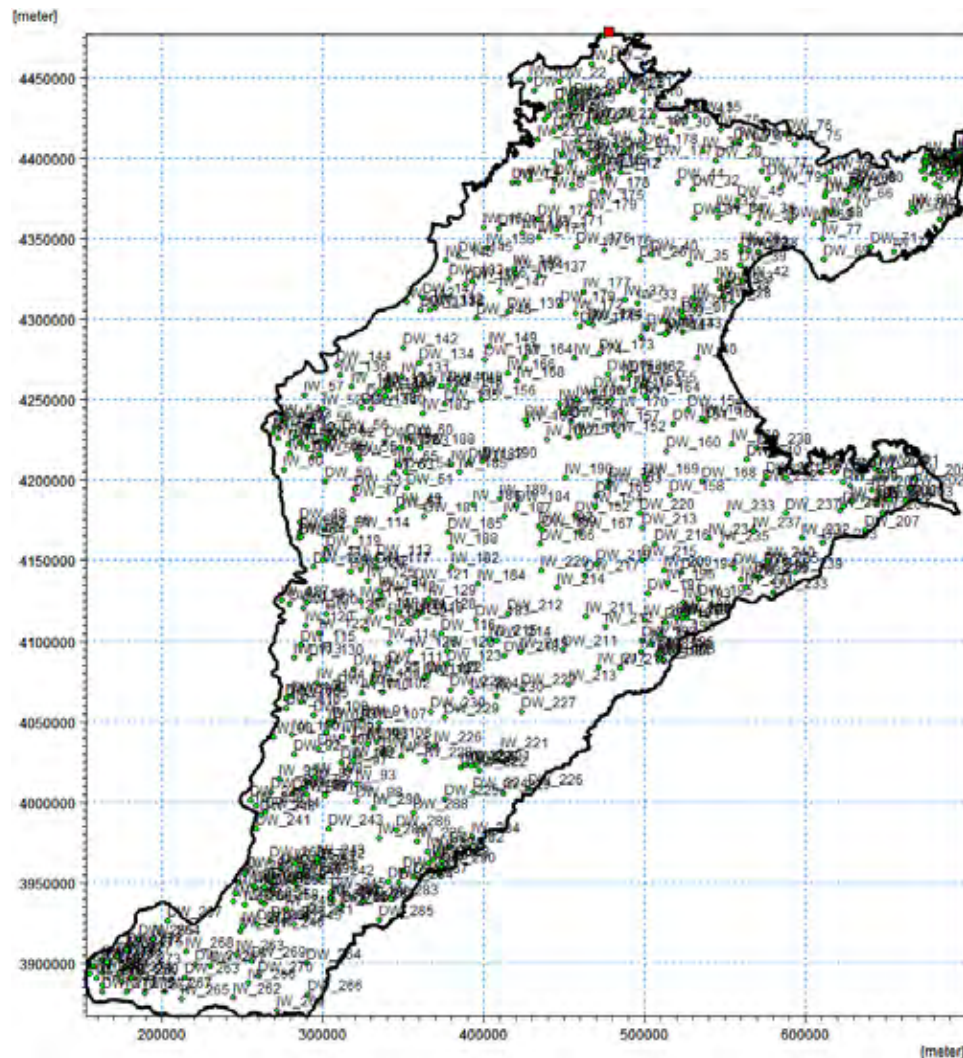
West-East cross section of NCP, from Cao.

Vanding



- Vanding styret af afgrøder
 - Hvede 5 x årligt
 - Majs 2 x årligt
 - Bomuld 2 x årligt
 - Frugttræer 4 x årligt
- Primært overfladenære borer og 10% dybere borer
- 3 zoner for at afspejle forskelligt vandingsbehov

Indvinding til industri og husholdning

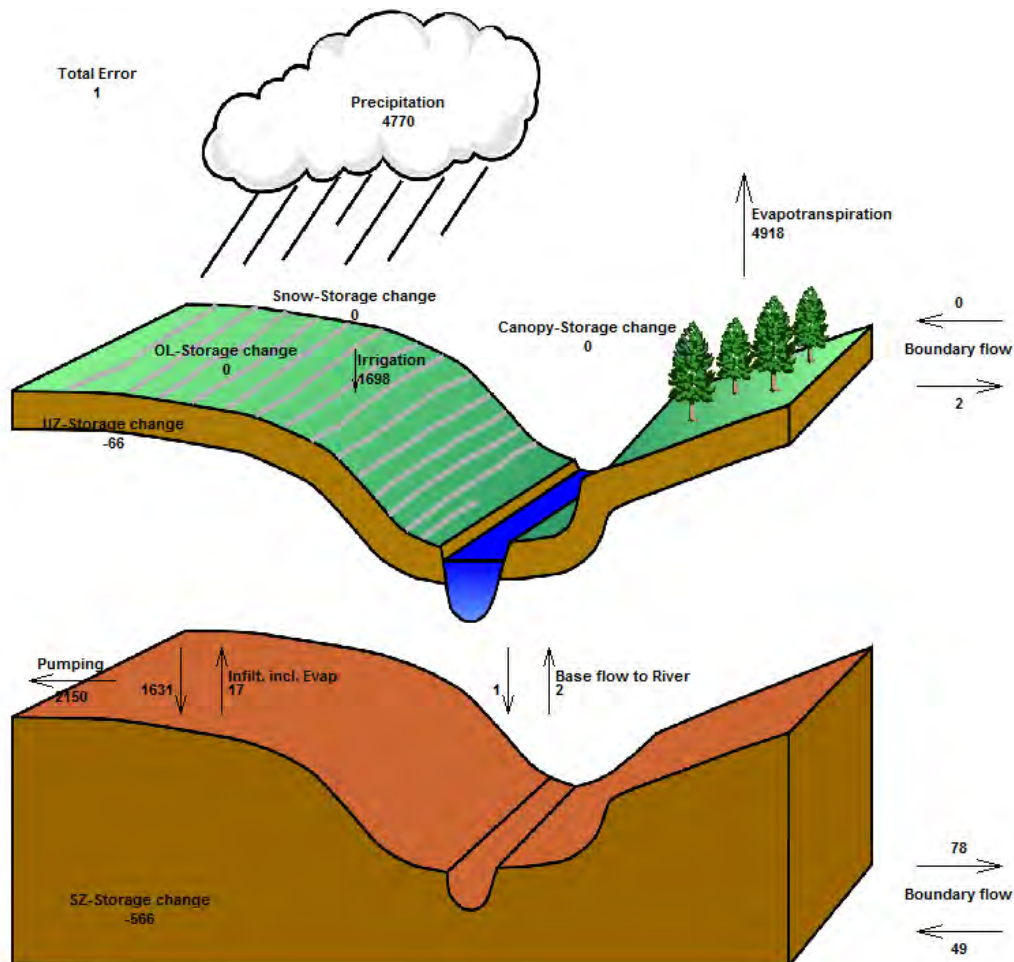


- GDP omsat til vandbehov
- PE omsat til vandbehov
- GDP, PE fra System Dynamics method (Qin et al., 2012)

$$DW(i,t) = \frac{DWT(i,t)}{N_i} \quad IW(i,t) = \frac{IWT(i,t)}{N_i} \quad 1 \leq i \leq 21 \quad (1)$$

- 21 områder
- Årlige værdier
- I alt 580 boringer

Klimadata



- Nedskalerede nedbør ☹️
- Standard RS nedbør ☺️ TRMM
- Aktuelle fordampningsdata ☺️

Resultat



Integrated Hydrological Modeling of the North China Plain and Implications for Sustainable Water Management

Huanhuan Qin^a, Guoliang Cao^a, Michael Kristensen^b, Jens Christian Refsgaard^c, Mads Olander Rasmussen^d, Xin He^c, Jie Liu^a, and Chunmiao Zheng^{a, e, *}

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(*Corresponding author: Chunmiao Zheng; czheng@ua.edu; phone: +1 205 348 0579)

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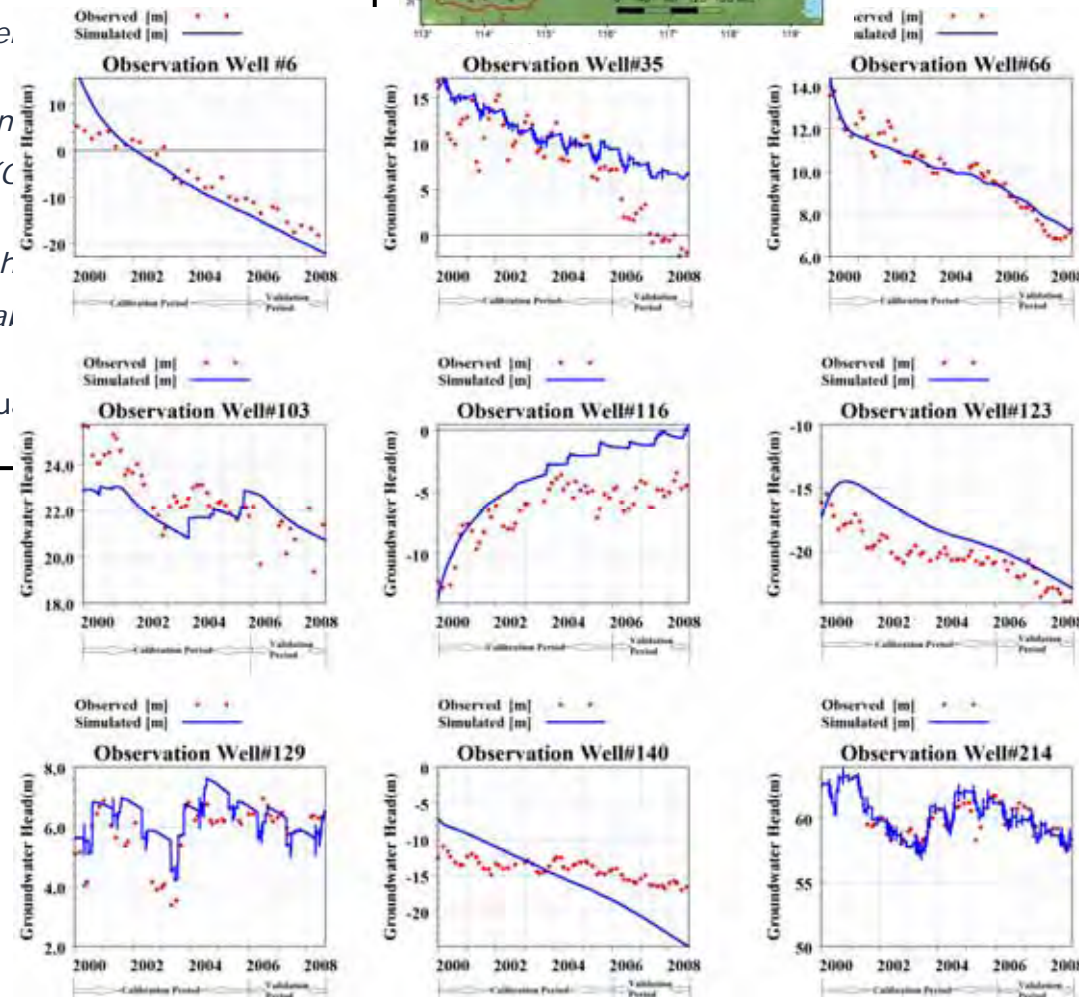
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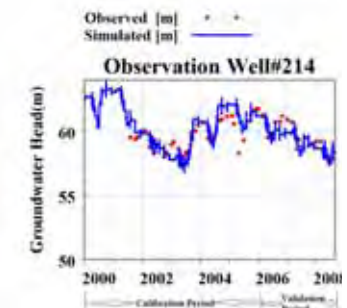
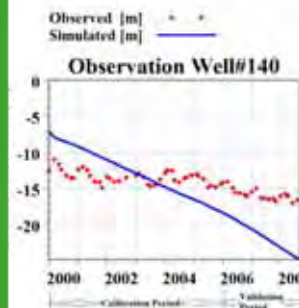
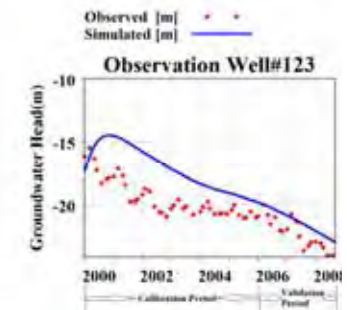
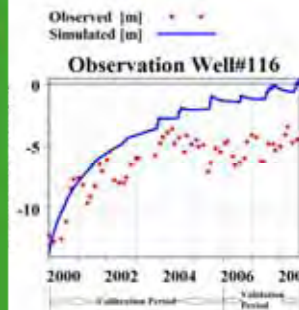
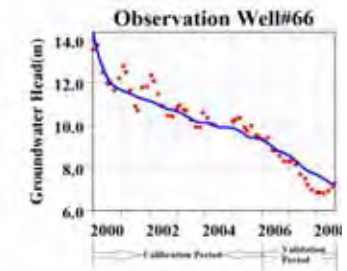
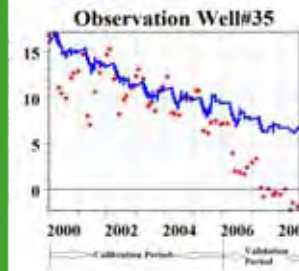
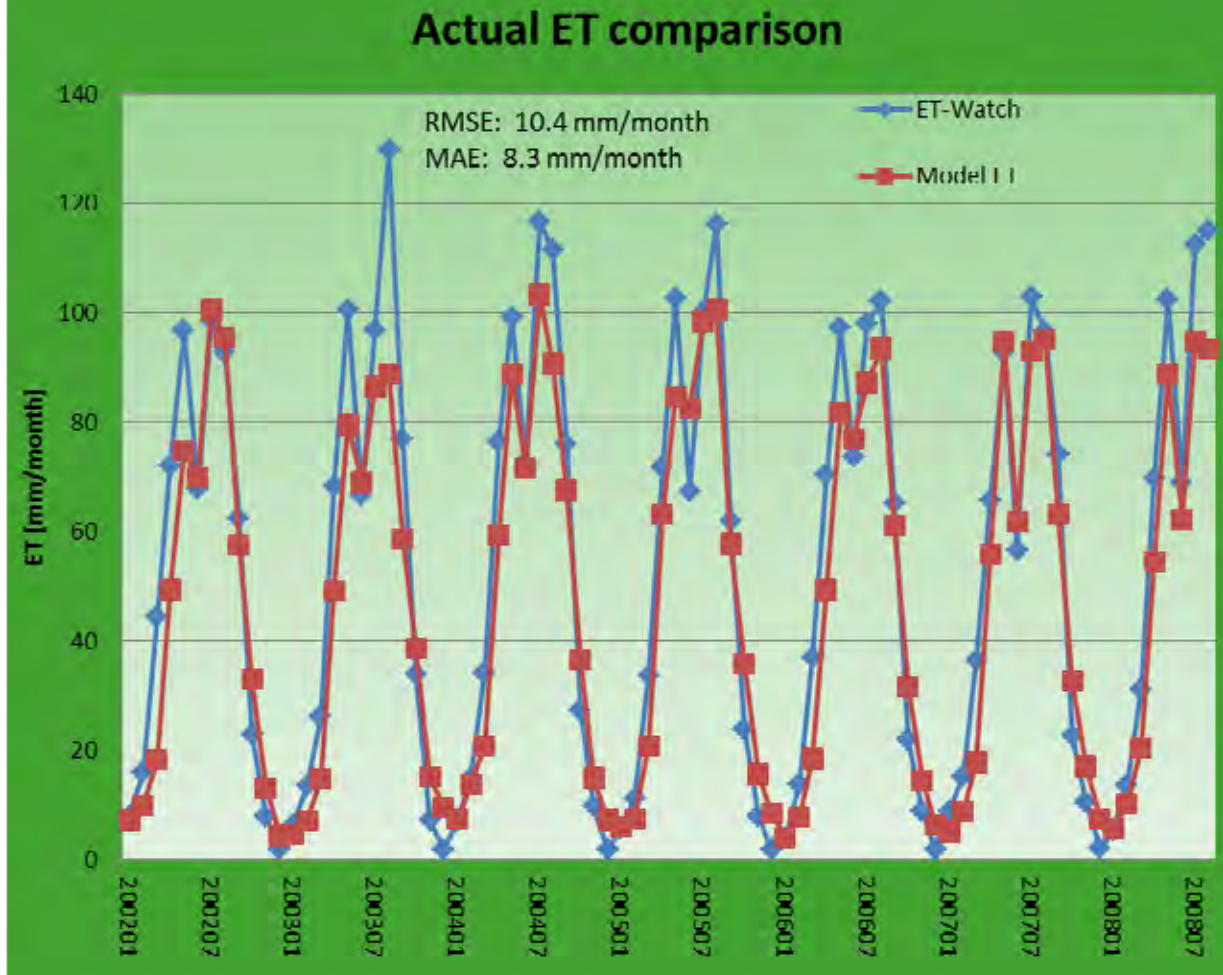
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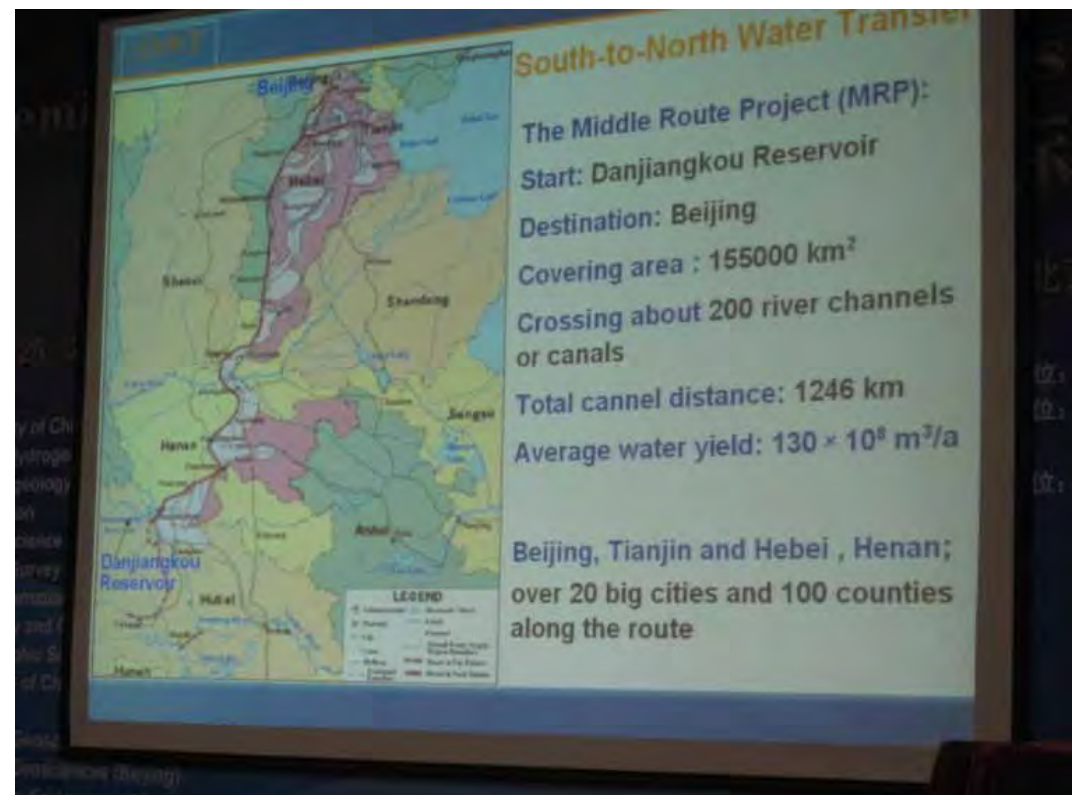
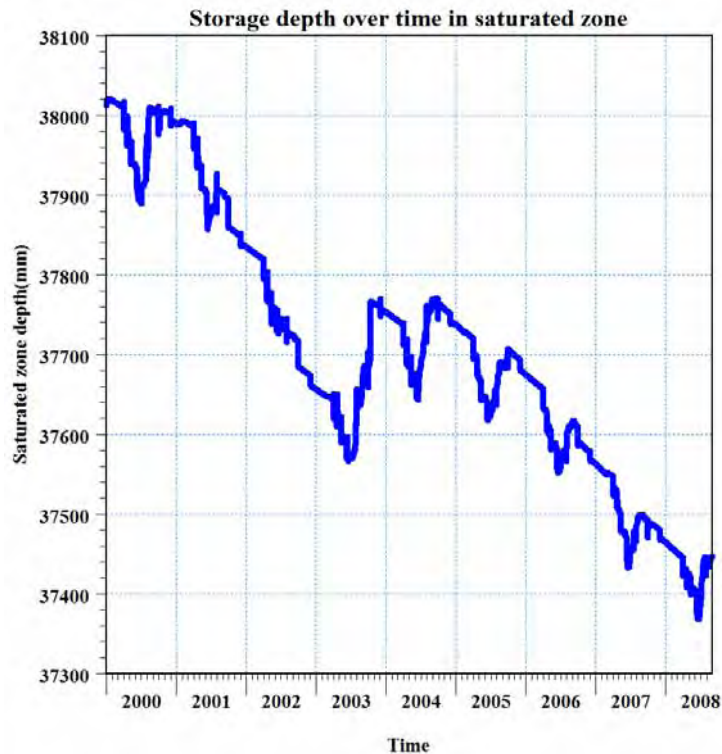
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Hvor efterlader vi kineserne ?

- ... med rammerne for at undersøge effekten på vandressource ved forskellige tiltag
- ... med muligheder for at forfine en fysisk baseret model
- ... med udgangspunktet at undersøge forureningsproblemer
- ... med massive udfordringer



Afsluttende bemærkninger

- Ambitionen om at anvende udviklet metoder et andet sted i verden delvist opfyldt.
 - Nedbørsdata ☹ Men vi havde alternativer ☺
 - Fordampningsdata ☺
- Implementeret integreret modellering på PKU.
- Vandbalance program som har muligheder for at blive forfinet.
- Arbejdet har resulteret i en erkendelse hos de kinesiske partnere at vandingen i NCP er en afgørende faktor for vandforbruget.
- Løftet problematikkerne i en artikel.
- Etableret relationer til PKU og IRSA.
- Et af lokomotiverne for verdens økonomi risikerer at miste dampen pga. vandressource problemer.

The image features a background of two shades of green. A lighter green area on the left and bottom-left corners is separated from a darker green area on the right and top-right corners by a diagonal line. Centered in the lighter green area is the word "AECTIA" in a bold, white, sans-serif font. Below it, the tagline "Masterminding Sustainable Progress" is written in a smaller, white, sans-serif font.

AECTIA

Masterminding Sustainable Progress