Numerical and empirical study of annual flood dynamics in the Volga-Akhtuba floodplain

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Wageningen University, IMARES, Deltares,
Volgograd State Fisheries Institute, WL | Delft Hydraulics, Moscow State University

Objective:
To document and simulate the annual flooding pattern in the Volga-Akhtuba floodplain
Using empirical study and numerical modelling

Study Area

The Volga-Akhtuba floodplain is situated in the Lower Volga River Basin, in Russia. The study area is about 100 by 30 kilometres.

Volga Basin

717102050039185a
2003/05/25
R 171 R 26
TMT ETM+
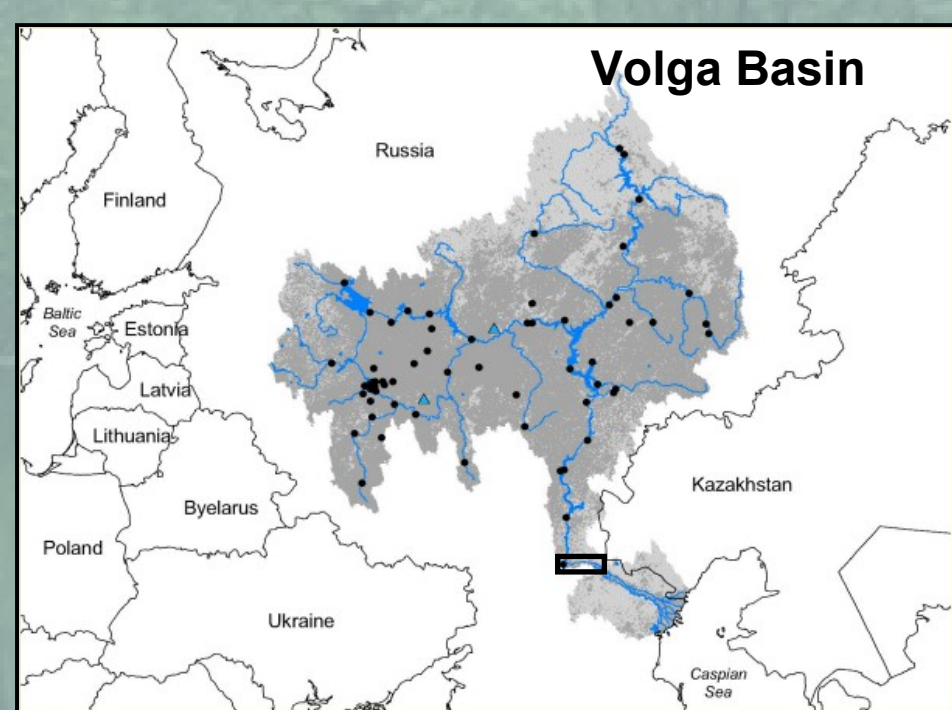
Field measurements

- Channel profiles
- Bridge profiles
- Dikes and culverts
- Water levels
- Flow velocity
- Absolute elevation
- Temperatures

Channel profile measured with leveller
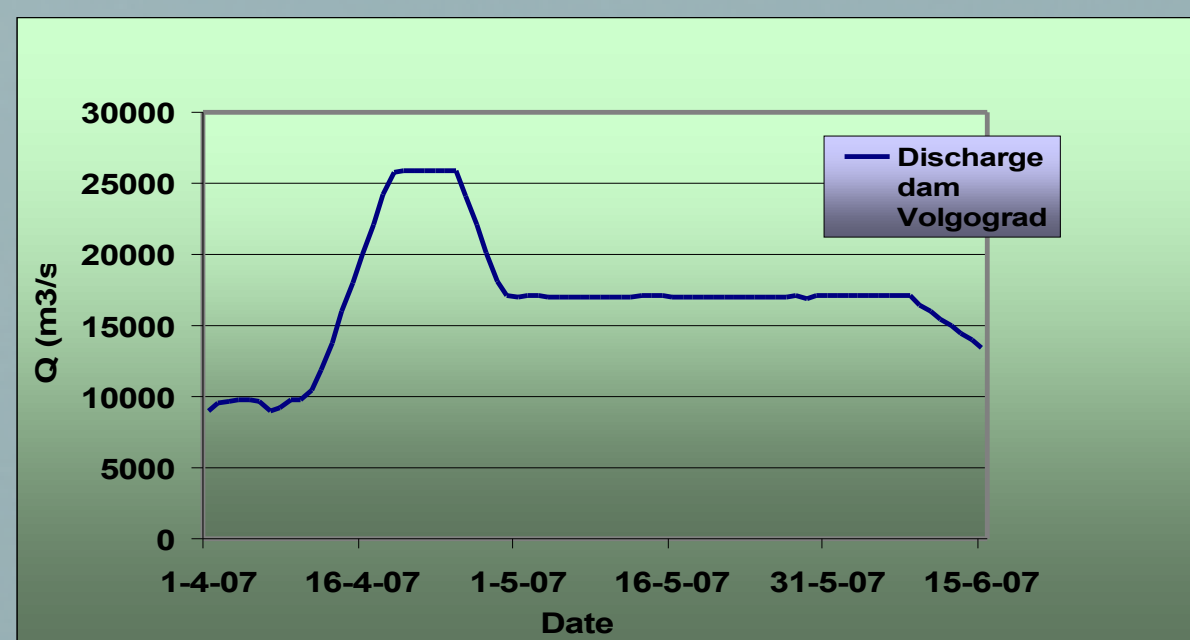
Height and width measurement of culvert

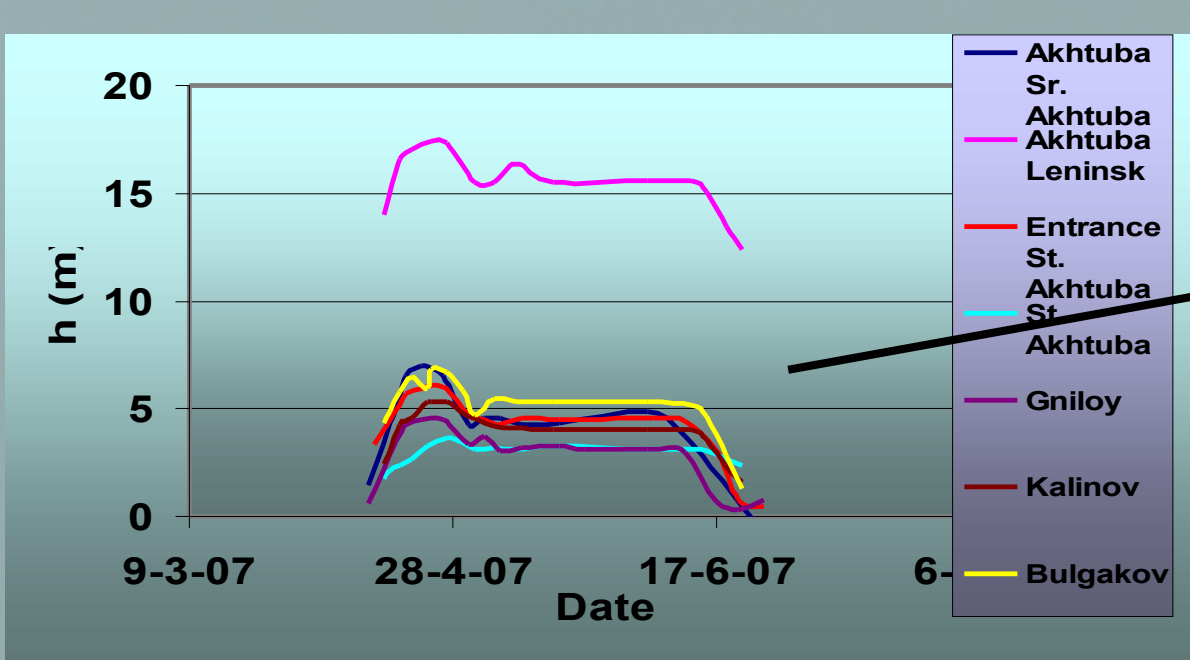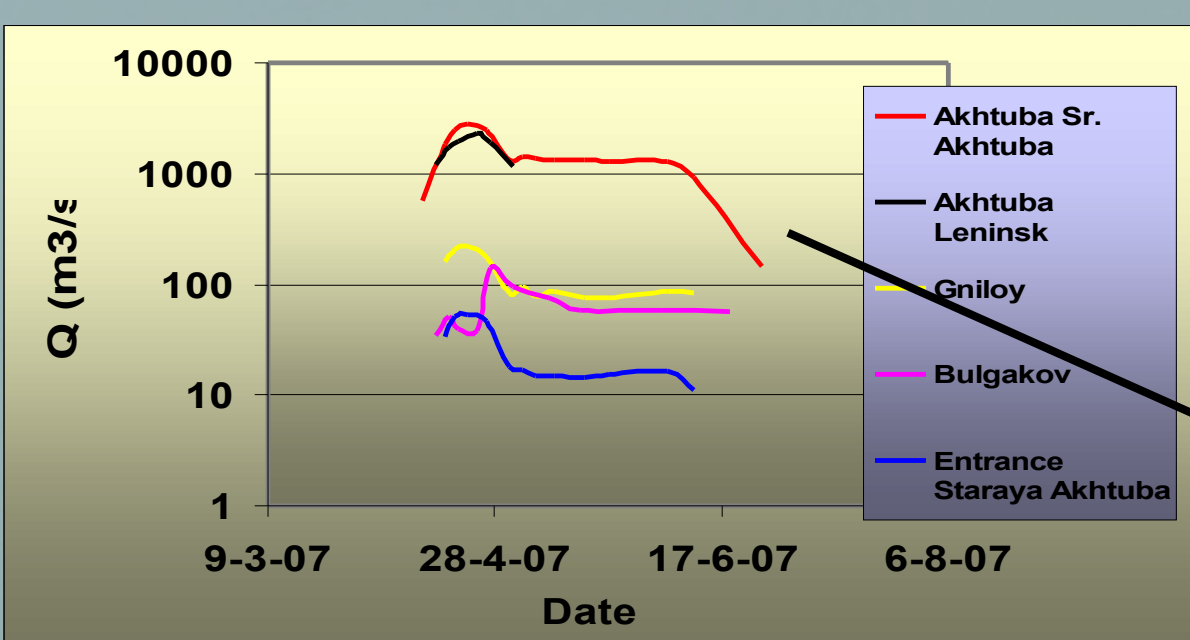Flow velocity measurement instrument: Ottmill

Water level measured with the use of water pressure loggers

Field observations

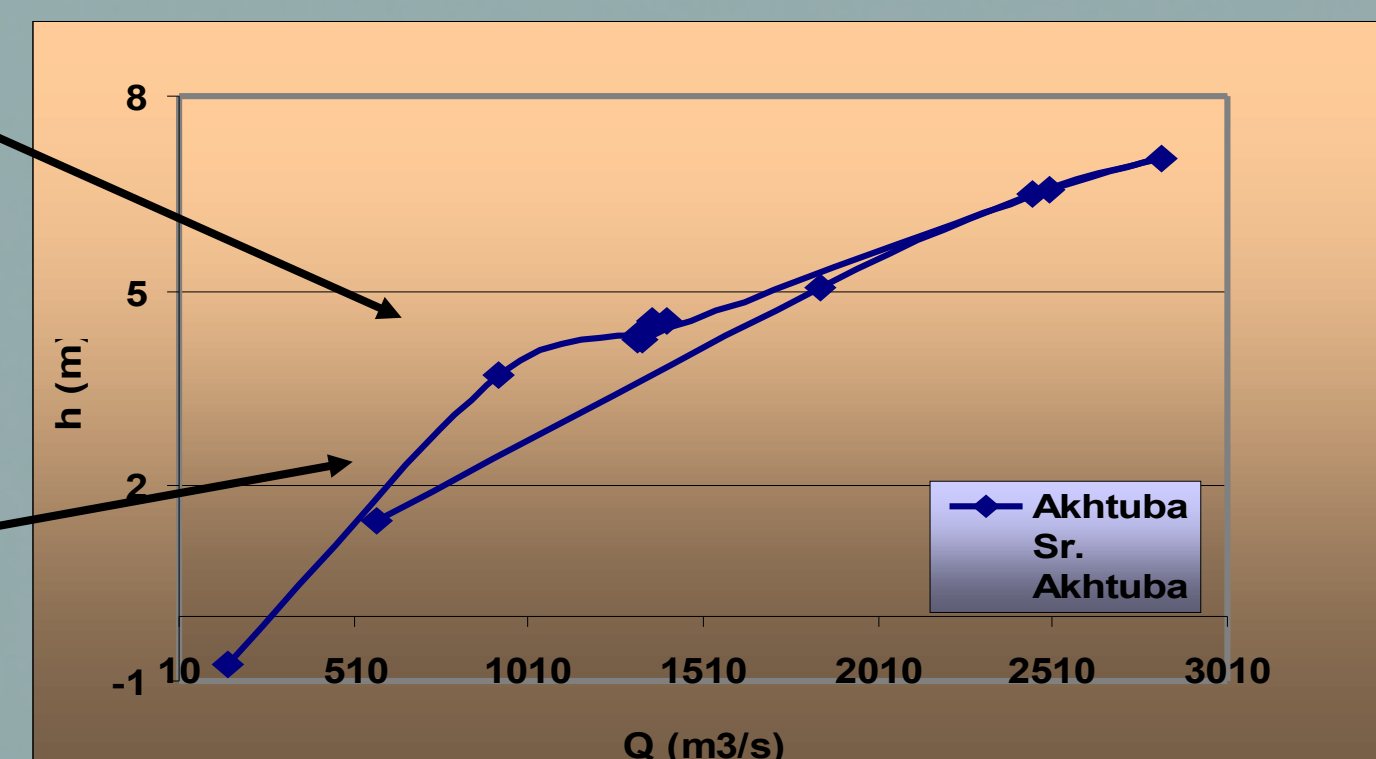2007 spring flood discharge at the Volgograd Dam

Discharge and water levels of 2007 spring flood at several locations in the floodplain

St. Akhtuba
Entrance St. Akhtuba
Akhtuba Sr. Akhtuba
Akhtuba Leninsk
Gniloy
Bulgakov
Kalinov

Qh-relation

Numerical modelling

1D elements
- Floodplain channels
- Dikes and bridges
- Constructions (culverts, dams)

2D grids
- Elevation
- Surface roughness

Model input time series
- Inflow (Q)
- Outflow (h)

SOBEK 1D/2D model
1D channel flow + 2D overland flow
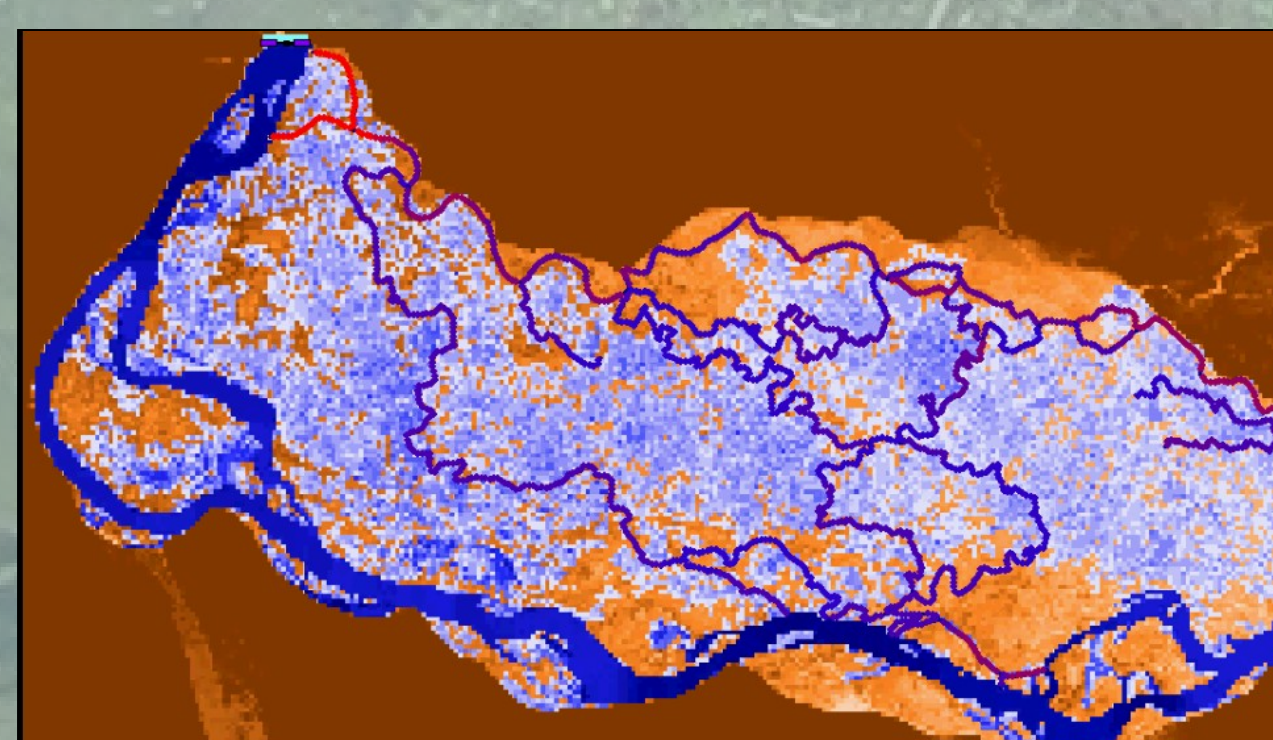The 1D channel network is plotted on the DEM

Remote sensing

Use time series of MODIS and Landsat TM satellite images from spring 2007 to:
- Calculate volume of water in the floodplain in time → discharge
- Make a link between field observations and satellite images
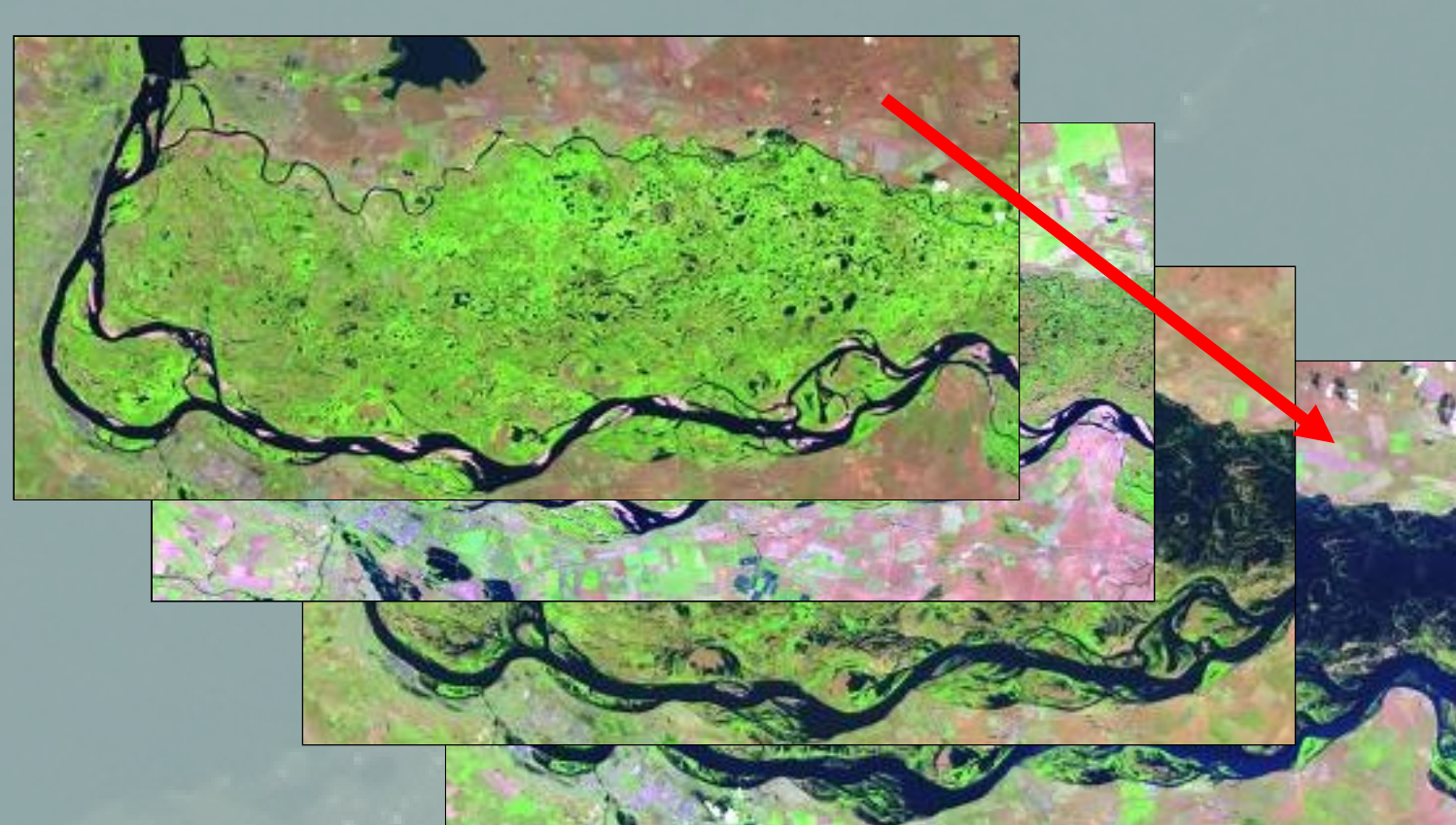
Model output: 2D time series
- Water levels
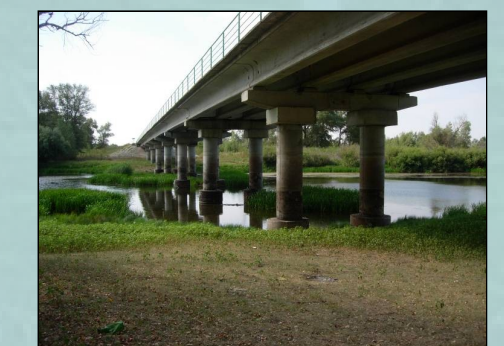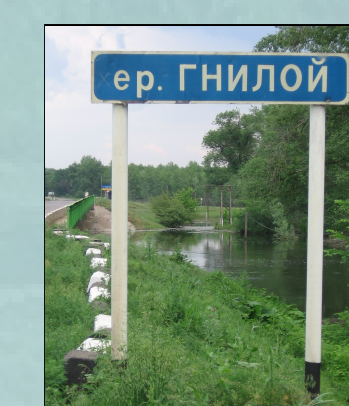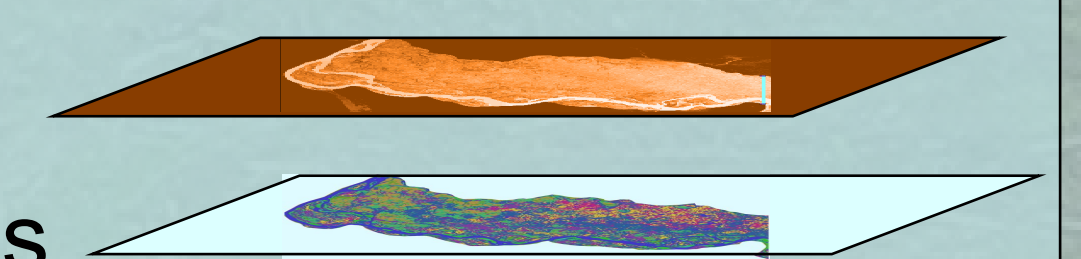- Flow velocities
- Inundation duration

Flood water patterns
- Area
- Connectivity
- Duration