What is the spatial and temporal variability in the world’s terrestrial surface water storage and how can we predict these variations more accurately?

Surface water storage is one component of the total land water storage, hence of the water balance at river basin scale. However, as other storage components (snow pack, soil moisture, ground waters), it is very poorly known globally because well distributed and continuous in situ networks are lacking. By measuring surface water levels, water bodies areas, river width and slope, a number of derived hydrological products will be estimated such as surface water volume and river discharge, and their spatio-temporal variability in response to climate variability /change and direct anthropogenic forcing. These observations will be of crucial importance for a number of scientific and socio-economic applications :

- Climate science: better understanding of the large-scale terrestrial water cycle and its variations in response to climate and human activities; observations will help improving climate models developed for future projections (in particular regional trends of the terrestrial water cycle)

- Hydrologic/hydrodynamic modelling at river basin scale (precise description of the river water balance and its response to forcing factors through WATER-HM data assimilation in regional models) for a number of different applications (e.g., surface water availability, sediment transport, carbon cycle, etc.)

- Study of extreme events (floods): calibration/validation of flood prediction models through WATER-HM data assimilation

- Inference on ocean studies: thermohaline circulation, coastal erosion, terrestrial waters contribution to sea level; improvement of OGCMs

- Environmental studies: ecosystem dynamics, carbon cycle, etc.

- Socio-economic applications: monitoring of surface water resources; navigation (from NRT knowledge of river level and discharge), flood and drought predictions, human health, etc.

To ‘predict’ spatio-temporal change in surface water storage we need to improve models. The first step is to have at our disposal a global data set of high-precision and high-spatio-temporal resolution of ‘primary’ hydrological parameters (level, area, slope) from which will be derived additional hydrological products (e.g., river discharge, water volume, etc). These observations, while being analysed directly, will be assimilated in a series of hydrologic/hydrodynamic/climate models, among these global land surface models used to predict water resources.

How much water is stored on a floodplain and subsequent exchanged with its main channel?

Addressing to this question is very important for studying sediment transport in a river basin and carbon cycle (CO₂ exchange between wetlands/floodplains and lower atmosphere). However answer will come from precise, high resolution hydrological modelling at river basin scale and is not disconnected from question 1. This is just a particular application of better knowledge of ‘spatial and temporal variability in the world’s terrestrial surface water storage’.

What are the policy implications that freely available water storage data would have for water management?

Not expert for answering this question. But it seems evident that freely available, global, high resolution time series of water level and river discharge time series (that ignore transnational boundaries) will have profound implications on water management at country level, especially in river basins with multiple country crossing (e.g., Mekong) where downstream nations (e.g., Vietnam) are highly dependent on upstream activities (dam building, irrigation, etc).
Can health issues related to waterborne diseases be predicted through bette mappings?

Not expert for answering this question. Certainly an important question. Research is emerging in this area. Needs pluridisciplinary approach.