Hydrological Analysis and Water Resources Management of Large River Basins

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Large River Basins (LRBs) are the most important natural systems providing water resources for natural and human use on our Earth. In the context of this conference, we want to provide a forum for presenting and discussing methods to analyse, quantify, model and manage large river basins, which we define here as hydrological systems with a catchment area > 100,000 km². The water resources of many – but not all – of such basins have been used intensively since many decades or even centuries.
Examples for such systems with very high importance for the society of this regions are, for instance, the basins of the Ganga (South Asia), Mekong (SE Asia), Indus (Pakistan and India), Euphrates (W Asia), Danube (Central and E Europe), Volga (E Europe), Rhine (Central Europe), Rhone (Central Europe), Nile (Central and NE Africa), Niger (W Africa), Senegal (W Africa), Zambezi (S Africa), Mississippi-Missouri (N America), Sao Francisco (Brazil), Paraná (S America), Murray Darling (Australia).

Adopting a systemic approach to analyse Large River Basins by, it becomes clear that LRBs constitute complex systems at various levels:

- The different compartments of such hydro systems (aquifers, rivers, lakes, river and lake sediments, vegetation cover, vadose zone) usually are coupled and thus do influence each other.
- The different types of water resources (groundwater, surface waters in rivers and lakes) are used often in a competing manner.
- As most water resources are spatially interconnected, in particular rivers, they constitute a network-type of system, mostly of dendritic type.
- Man-made structures, such as reservoirs, canals and water diversions, further increase the degree of connectivity of different types of water resources,
- The specific eco-system functions of certain compartments of LRBs (e.g., “self-purification capacity” of rivers, subsurface water storage in aquifers, retention or retardation of contaminants by sediments) result in a potential to at least partially cope with negative impacts or even hazardous events within that particular LRB.

From a management point of view LRBs are addressing some particular challenging scientific questions:

- How to organize and optimize a multi-objective management of water resources under competing interest and the need for sustainable resource-use?
- What are the predictive power and the associated uncertainties of forecast systems for the state of water resources in LRBs? This is in particular relevant for hydrological extremes.
- What are the long-term (e.g. several decades) development perspectives of LRBs’ water resources under transient internal and external conditions and under changing water demand from industry, agriculture and domestic sectors?
- How can a reasonable network-type of water resources use and management be achieved, including the consideration of different interests of upstream and downstream users or several countries?

We invite contributions to those research questions. Both case studies to certain LRBs and/or more methodological oriented studies are welcome. The latter ones may comprise the presentation of

- Data allocation and processing techniques, including remote sensing information;
- Recent model developments, which are tailored for such scales and for transient systems conditions;

- Systems to support comprehensive data analysis and visualization and/or management decisions;
- Integrated model systems, designed for stake-holder oriented applications.

We would like to encourage the contributors to address both the potentials and constraints of the currently available systems, to point out further development and organizational needs to achieve real applications of those tools, and more basic research needs.