AN INTEGRATIVE WATER BALANCE MODEL FRAMEWORK FOR A CHANGING GLACIATED CATCHMENT IN THE ANDES OF PERU

Integrative water balance model RS MINERVE

In the Santa River catchment [SRC] (Cordillera Blanca, Andes of Peru), human livelihoods strongly depend on year-round streamflow from glaciers and reservoirs, particularly in the dry season and in adjacent arid lowlands.

Nonetheless, changes in the complex network of hydroclimatic and socioeconomic drivers in combination with water allocation (**) enhances local water scarcity (**) and increases annual discharge variability and river contamination levels, particularly in middle and lower areas of the SRC (Fig. 1).

Upper catchment

Lower catchment

A first simulation run suggests that ongoing hydroclimatic and socio-economic changes regionally affects human water supply:

Preliminary results

A first simulation run suggests that ongoing hydroclimatic and socio-economic changes regionally affects human water supply:

Middle/Lower catchment

++ Irrigation and hydropower schemes require more water

+ (Urban) domestic demand

Particularly in the middle catchment and at the coast multiple water users are increasingly competing with less continuous river streamflow. This situation exerts further pressure and conflict potentials over water resources.

Conclusions and discussion

- Model framework as progress in integrative modeling at daily time step in remote areas
- Useful tool for local stakeholders and decision makers who increasingly have to put into practice Integrated Water Resources Management plans

Future adaptation and hydrological risk reduction in the context of Peru’s institutional transformation process

In Peru, institutional obstacles persist and high uncertainty partially limits the results due to data inconsistencies and a complex interplay of multiple drivers of change within a steep topography and diverse climatic setting

Future research must deal with data scarcity (e.g. copula-based approach), uncertainty and foster water management and adaptation in close collaboration with science, society and policy

Model setup

- Manual catchment edition using SRTM 0.4 Alos Palsar (12.5 m) data, 300 m contour intervals, merging rules
- 382 elevation bands in 64 subcatchments with 39 junctions and 40 river segments remaining
- Calibrated and validated in 22 different zones using Kling-Gupta efficiency and the Coupled Latin Hypercube with Rosenbrock optimization algorithm (Fig. 3)

Further reading


Acknowledgements

This study is a part of the "Proyecto Glaciares" in Peru and funded by the Swiss Agency for Development and Cooperation (SDC)