To assist hydrometeorological forecasts and political decision processes independent and freely available information on water parameters, e.g. lake and reservoir levels (L&R), are in high demand. Over the past years, radar altimetry (RA) became a tool for monitoring inland water bodies. New missions and recent reprocessing of data, acquired during previous missions, allow a construction of time series of lake and reservoir levels back to 1993. Such data allow studies of natural changes in the water availability as well as examination of changes in reservoir fillings.

RA, developed for ocean applications, also provide reliable surface heights over lakes, reservoirs and large rivers (L&R). Due to the nature of the reflecting surface, waveform analyses can improve the range estimates. Part of the GDR’s are sets of retracking functions, which are used for this study of the Toktogul, Kairakum, Shardara, and Aydarkol Reservoirs.

For the hydrometeorological forecasts, the L&R heights need to be converted into water volume changes. For this purpose the hypsometry of the individual water body is needed. For most water bodies in CA no external volume information is available. Remote Sensing can provide time series about the water area extent. In combination with RA heights over the full range of water table changes, the conversion function (left) can be developed to estimate volume changes in relation to the lowest water height. Depending on the function the derived volume change can be different (right, linear function versus exponential function). For Shardara, the area information from Klein et al. (doi: 10.1016/j.jag.2013.08.004).

The water released from Toktogul drains towards the other three reservoirs. It is obvious, that Toktogul is used for hydro-power generation in winter, where the other reservoirs try to store as much as possible for irrigation in summer. The decrease in water volume for Toktogul for the past years also indicate the over-user (or dry periods). Also the Shardara show slight decrease in storage. Aydarkol used as back-up storage for Shardara also show decreasing water storage.