

# 3<sup>rd</sup> International Conference on **Earth Science & Climate Change**

July 28-30, 2014 DoubleTree by Hilton Hotel San Francisco Airport, USA

## **Impact of warming climate and monsoon water-resources of a western Himalayan watershed of Upper Indus Basin**

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This study discusses impact of warming climate and monsoon on Astore watershed water resources, one of the major tributary of Upper Indus Basin (UIB), using long time series climatic stations precipitation and temperature (1954-2010), Tropical Rainfall Measuring Mission (TRMM) 3B43 (1998-2010), Global Precipitation Climatology Project (GPCP) precipitation (1979-2010), flow (1974-2010) monthly datasets, and Landsat images. Average temperature data show statistically significant increasing trends for November-June during 1988-2010, while June and July, which bear more episodic and intense precipitation, show statistically significant increasing/decreasing trends during 1974-1992/1993-2009. Decrease in summer snow-cover has also been confirmed during 1978-2008, particularly during 1998-2008, using Landsat data for visual inspection. Increasing spring discharge, shift in timing of annual peak discharge, and increase in melt component with simultaneous increase in glacial melt component in river flows are accompanied by depletion of glacial storage within Astore watershed, during 1997-2009 as compare to 1974-1996. Besides increase in glacier-melt during 1997-2009, flows have milder increasing trends as compare to 1974-1996 due to decrease in monsoon precipitation. If current trends in river flows continue in the future for long and the climate change continues to follow the same path that it has been following during the past decades then river flows will eventually take a falling path once the glacial reserves will no longer be able to provide a sustained nourishment to the river waters. Thus, there is intense need to adopt current flow and climatic parameters' trends in future hydrological and reservoir operation models.<sup>3</sup>

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